

WORLD GLAUCOMA CONGRESS

Paris, June 29 - July 2, 2011

ABSTRACT BOOK



Sponsored by the Hippocrates Glaucoma Foundation

WORLD GLAUCOMA ASSOCIATION
The Global Glaucoma Network

WORLD GLAUCOMA CONGRESS

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COURSES OUTLINES

C01 GLAUCOMA EPIDEMIOLOGY: PREVALENCE AND DIAGNOSIS

F. Topouzis (chair), R. Varma (chair), W. Nolan (chair), T. Aung, W.J. Feuer, D.S. Friedman, M. He, R. Thomas, R. Wilson

Description: The course will include presentations on open-angle glaucoma (OAG) prevalence and incidence and on the various OAG definitions used in population-based prevalence studies, as well as presentations on angle-closure glaucoma (ACG) prevalence and incidence and on ACG definitions used in population-based studies. Panel discussions will evaluate proposed published schemes on definition and classification and will highlight the significance of the diagnostic criteria to define glaucoma in different studies and whether any consensus can be drawn. The methodology and importance of accurate diagnosis and classification including primary and secondary OAG and ACG classification will also be discussed

C02 ELECTROPHYSIOLOGY AND GLAUCOMA DIAGNOSIS

S. Graham (Chair), C. Bowd, B. Fortune

Synopsis and Objective: This course will cover the role of electrophysiological testing in glaucoma based on a review of evidence from both basic and clinical studies. The course will focus on the pattern electroretinogram (PERG) and multifocal visual evoked potential (mfVEP) since these are the two most relevant to clinical diagnosis. We will describe the utility of these tests as a means for detecting and monitoring functional loss, including data from recent studies in early glaucoma, and outline some newer research areas. Emphasis will be placed on the diagnostic performance of each technique, as well as their strengths, weaknesses, and relationship to other diagnostic tests, rather than on their technical or procedural aspects.

C03 CONGENITAL AND INFANTILE GLAUCOMA

A.K. Mandal (chair), M.G. Lynch (chair), P.A. Netland, L. Solebo

Description: This course will present the diagnostic evaluation, differential diagnosis, and management of the pediatric glaucomas. Recent management in the medical and surgical therapies including antifibrotic therapy (mitomycin C and 5-fluorouracil), glaucoma drainage devices, and cycloablative procedures will be discussed. Secondary glaucoma after infantile cataract surgery will also be highlighted. At the conclusion of the course, the attendees will be familiar with the holistic care of developmental glaucomas.

C05 LASER SURGERY FOR OAG

L.J. Katz (chair), M. Wand (chair), J. Alvarado, M.A. Latina, J. McAllister, G.D. McLaren, J. Myers

Description: Laser trabeculoplasty (LT) has been increasingly utilized and its role more clearly delineated in the treatment of open angle glaucoma. This course will update

participants on the proposed mechanisms of action of laser trabeculoplasty (Dr. Alvarado), the effectiveness and indications of selective LT in different types of glaucoma (Dr. Latina), SLT in African Blacks (Dr. McLaren), the role of LT as primary treatment in glaucoma and OHT (Dr. McAllister), the role of repeat LT (Dr. Wand) and an economic analysis comparing LT and medical therapies (Dr. Katz). 'It is unethical not to offer SLT as primary therapy', will also be addressed (Dr. Myers).

This course will end with an open discussion on where LT fits into the treatment ladder for glaucoma.

Objectives: at the end of this course, participants should have a better understanding of how laser trabeculoplasty works, the indications and relative effectiveness of laser trabeculoplasty in different types of glaucoma, and when to utilize this modality in one's glaucoma practice.

C06 TRABECULECTOMY: PEARLS AND PITFALLS

F. El Sayyad (chair), R. Ramakrishnan (chair), I. Al Aswad, N. Pfeiffer

Description: Trabeculectomy is considered the gold standard surgical approach for the management of glaucoma. The outcome of trabeculectomy does not only depend on the surgical technique but also on the appropriate management of post operative period. Use of antimetabolites, releasable suture, collagen implant etc., have definitely increased the success rate. However trabeculectomy is proved to have numerous short term and long term complications including shallow anterior chamber, choroidal effusion, hypotony, bleb related problems including leaks, blebitis and even endophthalmitis... etc.

This course will present a systemic video assisted review of pearls when performing trabeculectomy to enable the participants to understand the technique in a stepwise manner with various modifications in this technique to improve the overall success. It will also teach an interpretive strategy for facilitating recognition and management of common pitfalls that may be encountered during the procedure and post operatively.

C07 CLINICAL TRIALS & EVIDENCE BASED GLAUCOMA

L. Sakata (chair), W.J. Feuer (chair), T. Aung, D.L. Budenz, C.G. De Moraes

Synopsis: Randomized clinical trials (RCTs) are the gold standard for comparing medical and surgical treatment safety and efficacy. However, trial design must be understood when generalizing results to non-study patients. This course will focus on how to properly incorporate RCT information into the management of glaucoma patients in the daily practice, what are the levels of evidence for selecting the best surgical procedure, and what we know/ what we still need to know about the treatment of the angle closure disease.

C08 TONOMETRY AND CORNEAL BIOMECHANICS

J.D. Brandt (chair), L.E. Pillunat (chair), N. Congdon, D. Garway-Heath, J. Jonas, J. Liu, D. Mackey, A. Sit, A. Wells

Description: Over the last decade, ophthalmologists have

come to recognize that our techniques to measure intraocular pressure (IOP) are far less precise and accurate than previously believed. In large part this has been due to renewed interest in central corneal thickness (CCT) brought on by clinical trials that demonstrated significant artifact in Goldmann Applanation Tonometry (GAT). The GAT no longer sits on a pedestal as a 'gold standard' instrument. This course will review the principals behind tonometry, the role of CCT as both a tonometry artifact and as a glaucoma risk factor techniques, new research into diurnal patterns and the future of new tonometry techniques and 24 hour IOP monitoring. We will include examples of patients in whom problems with tonometry might play a role in diagnosis and management.

C10 PRIMARY ANGLE CLOSURE: DIAGNOSIS AND TREATMENT

W. Nolan (chair), G. Gazzard, M. He, N. Wang, H.T. Wong

Outline: This course aimed at Glaucoma specialists and general ophthalmologists will provide an update on current clinical diagnostic methods and treatments of primary angle closure. The focus will be on practical management of the disease enabling clinicians to optimize their care of patients with angle closure.

Topics that will be covered in the course include:

- Risk factors and clinical examination including gonioscopy (Ningli Wang, China)
- Anterior segment imaging (Mingguang He, China)
- Laser iridotomy and iridoplasty (Gus Gazzard, UK)
- Lens and cataract extraction for angle closure (Hon Tym Wong, Singapore)
- Management of acute angle closure (Winnie Nolan, UK)

Current evidence supporting treatment options will be presented and areas of debate and controversy will be discussed. The WGA consensus statements on diagnosis and treatment of angle closure will be presented as part of this course.

C12 GLAUCOMA DRAINAGE DEVICES – PART 1

J. Freedman (chair), A. Molteno (chair), G. Baerveldt, E. Dahan, M. Sherwood, G. Trope

Description: Basic concepts of present-day drainage implants, including a description of long-tube implants, and briefly how to use them. A brief description of Ex-PRESS mini shunts and their use (Drs Sherwood and Dahan). Does size and implant composition effect the efficiency of the bleb? This will include current concepts that have appeared in the literature, and what the possible answer is at the present time (Dr. Baerveldt). Management of the common complications seen with implants, with special emphasis on tube complications and management (Dr. Trope). The cornea and implants revisited. Causes of corneal decompensation. Management of tubes with corneal transplants. Brief introduction by Dr. Sherwood, followed by panel discussion.

C13 GLAUCOMA DRAINAGE DEVICES – PART 2

J. Freedman (chair), A. Molteno (chair), S. Gedde

Description: The principles of bleb management. Basic physiology, and histological findings, with a discussion on factors that effect bleb function (Dr. Molteno). How and why to manipulate the aqueous and tissue to obtain a more effi-

cient bleb and influence the hypertensive phase (Dr. Freedman). How can clinical trials, and comparative studies of different implants help to influence the use and choice of implants? (Dr. Gedde). Panel discussion and questions from audience.

C15 GLAUCOMA HEALTH ECONOMICS

A. Tuulonen (Chair), S. Kymes (chair), J. Burr, R. George

Description: With advances in health technology and an aging population, the health care costs are taking an increasing share of economic output in both developing and developed countries. Since available resources are limited, they should be targeted to produce the best eye health by increasing both the length and quality of 'seeing years'. With the expected increase in prevalence of glaucoma in coming years, it is essential that we evaluate management strategies considering their impact on scarce resources and basis in evidence-based medicine and health care. The course gives an overview of the recent economic evaluations of glaucoma care, cost-effectiveness of diagnostic and therapeutic interventions and needs for prioritization. As the number of economic evaluations increases, the interpretation and critical evaluation is challenging.

C16 HOW TO DETECT AND CONFIRM PROGRESSION AND USE IT TO MANAGE GLAUCOMA

B. Chauhan (chair), A. Heijl (chair), B. Bengtsson, D. Garway-Heath, K. Kashiwagi, B. E. Prum, G. Tomita, L. Zangwill

Purpose: The purpose of this course is to review methods to detect progression of glaucoma and discuss how these can be implemented practically in the routine management of patients.

Objective: The objective in managing patients with glaucoma is to prevent functional visual impairment during their lifetime. To do this, one needs to know the stage of disease and the rate of progression. When lack of resources makes this impossible, available resources must be concentrated on patients with a clear risk of functional visual impairment. It is possible to risk profile patients on the basis of known risk factors for glaucoma and glaucoma progression, but risk-profiling is currently imprecise.

The course will discuss evidence from the literature (clinical trial and hospital-based data) for progression risk factors, outline the theoretical approaches for identifying progression (rate- and event-based approaches) and review published methods for detecting progression by analysis of visual field and imaging data. Barriers (such as variability, data quality, and lack of hardware and software support) to detecting progression will be considered, leading to a discussion of a practical approach in the real world.

C17 IMAGING 1: BASIC TECHNOLOGY AND DIAGNOSIS

C.K.S. Leung (chair), J. Schuman (chair), M. Fingeret, J. Fujimoto, H. Lemij, F. Medeiros, G. Wollstein, L. Zangwill

Description: Evaluation of the optic disc and the retinal nerve fiber layer is a key component to establish the diagnosis of glaucoma. With the advent of modern imaging technologies, objective and reproducible retinal nerve fiber layer and optic disc measurements have been made possible.

However, interpretation of these measurements may not be easy. This instruction course will discuss the basic technology and clinical applications of optical coherence tomography (spectral-domain and time-domain OCT), confocal scanning laser ophthalmoscopy (HRT) and scanning laser polarimetry (GDx) for glaucoma diagnosis. At the conclusion of this course, the attendees will be able to interpret the results and understand the advantages and limitations of these imaging instruments.

C18 IMAGING 2: PROGRESSION AND MANAGEMENT

C.K.S. Leung (chair), J. Schuman (chair), M. Fingeret, J. Fujimoto, M. Hangai, H. Lemij, F. Medeiros, G. Wollstein

Description: Monitoring longitudinal changes of the optic disc and the retinal nerve fiber layer is elemental to determine glaucoma progression. While serial assessment of stereo-photographs has been the conventional approach to detect optic disc progression, new algorithms have been developed to measure the rate of change of retinal nerve fiber layer and neuroretinal rim measurements with digital imaging technologies. This instruction course will provide an overview on the use of spectral-domain and time-domain optical coherence tomography, confocal scanning laser ophthalmoscopy (HRT) and scanning laser polarimetry (GDx VCC / ECC) to analyze glaucoma progression and discuss their roles in glaucoma management.

C19 SECONDARY ANGLE CLOSURE: DIAGNOSIS AND MANAGEMENT

G. Gazzard (chair), L. Vijaya (chair), S. Asawaphureekorn (chair), H. Sakai

Description: The course is intended to provide an overview of the mechanisms and pathogenesis of secondary angle closure glaucoma and how these principles can help to guide its management. It emphasizes the role of ultrasound biomicroscopy in diagnosis and management decisions. We will cover the common clinical situations that can lead to secondary angle-closure glaucoma and outline the appropriate management approaches.

C20 PRINCIPLES OF MEDICAL THERAPY IN GLAUCOMA PRACTICE

R. Fechtner (chair), A. Hommer (chair), J. Thygesen (chair), Y. Lachkar, L. Schmetterer, H. Tanihara

Description: Medical therapy continues to be the mainstay of glaucoma treatment. While there have not been any recent new medications or targets for medical therapy our understanding and practices continue to be refined. Published clinical trials have clearly demonstrated the benefit of IOP lowering through medical therapy but raise new questions about whom and how aggressively to treat IOP. We must continue to assess efficacy of therapy initially and for the long term. Enhancing adherence with a medical regimen remains challenging. In this course we will address current principles for initiating and maintaining successful medical therapy for glaucoma.

C21 EMERGING GLAUCOMA SURGERY – 1 (AB INTERNO)

D.J. Rhee (chair), T. Shaarawy (chair), M.S. Berlin, T. Samuelson, S. Vold

Description: This course will introduce and discuss emerging canal-based procedures and devices. Faculty will emphasize the presentation of evidence-based outcomes to define efficacy, safety, clinical utility/indications, and limitations. Additionally, a panel of faculty will discuss the possible utility of these procedures in the other parts of world where the particular device or technology may not be presently utilized. The general format is an alternating mixture of didactic presentation followed by panel discussion with specific focus on the utility, cost, possible indications and applications in other geographic regions to facilitate a global perspective.

C23 GLAUCOMA THERAPY AND OCULAR SURFACE DISEASE

R. Noecker (chair), M. Kahook (chair), R. Bourne (chair), C. Baudouin, R. Fechtner, M. Sherwood

Description: Preservatives are added to all multi-dose topical glaucoma medications to inhibit microbial contamination and are required by regulatory agencies prior to approval of marketed formulations. Benzalkonium chloride (BAK), the most common preservative in topical ophthalmic medications, has been linked to a number of different adverse effects such as disruption of the tear film as well as damage to the ocular surface epithelium in some patient populations. Information regarding emerging alternatively preserved medications and preservative free formulations will be discussed and the speakers will share recommendations for treating the glaucoma patient with ocular surface disease.

C24 EXPERIMENTAL MODELS IN GLAUCOMA

J.G. Crowston (chair), J.E Morgan (chair), P.L. Kaufman, K. Martin, C. O'Brien, C.B. Toris

Description: Experimental animal models form the backbone of pre-clinical laboratory research in glaucoma and have contributed much to our understanding of glaucoma pathogenesis and the development of new treatment strategies. These models, however, remain imperfect and translation of experimental findings into the clinical arena have often proved disappointing. This course will discuss the strengths and weakness of the most widely used experimental models and experimental endpoints currently used to measure optic nerve structure and function. Finally we will consider why translation into clinical practice has been generally disappointing and how this might be improved. The speakers are leaders in their fields and this course is intended for all delegates with an interest in experimental research in glaucoma.

C25 GONIOSCOPY AND IMAGING FOR ANTERIOR CHAMBER AND ANGLE EVALUATION

T. Dada (chair), D.S. Friedman (chair), M. He

Description: This course is intended to highlight the role of gonioscopy in current glaucoma practice along with utility of new anterior segment imaging modalities like UBM and ASOCT for evaluation of the irido-corneal angle, anterior and posterior chamber. This video-assisted course will instruct

the attendees on use of dynamic gonioscopy techniques for detection of primary angle closure and various gonio-pathologies in open and closed angle glaucomas. Indications for ultrasound biomicroscopy, and anterior segment OCT will be discussed along with recording of various angle parameters, utility as a screening tools, advantages and limitations of each technique. A comparative evaluation of anterior segment imaging techniques will also be presented.

C26 MOLECULAR PHARMACOLOGY OF AQUEOUS OUTFLOW

M. Araie (chair), A. Harris (chair), M. Honjo, M. Inatani, K. Sugiyama

Synopsis: There are two separate factors contributing to pathogenesis of glaucoma, that is, intraocular pressure (IOP)-dependent and IOP-independent damaging mechanisms. The blood flow in the posterior segment of the eye is closely related to the IOP-independent damaging processes and the aqueous flow in the anterior segment of the eye to the IOP-dependent damaging mechanisms. So much has been studied and reported regarding blood flow and aqueous flow in glaucoma, but so much has been left unstudied and unelucidated. This course will deal with topics which are felt to be highly interesting in further understanding of role of blood flow and aqueous flow in glaucoma, highlighting the findings obtained with apparatuses representing recent development of imaging or laser technology or those by up-to-date gene technology or molecular biological methods such as multiplex immunoassay.

C27 NEUROPROTECTION AND APOPTOSIS OF RETINAL GANGLION CELLS RELATED TO GLAUCOMA

N. Gupta (chair), K. Martin (chair), H. Quigley (chair), F. Cordeiro, D.S. Greenfield, T. Nakazawa, M. Schwartz, J.C. Tsai

Description: This one-hour forum will provide ophthalmologists with the newest information regarding the science underlying retinal ganglion cell damage and protection, pre-clinical imaging studies, the latest knowledge gained from clinical trials in neuroprotection, and their relevance to caring for patients with glaucoma.

Objectives: 1. To provide the latest information on mechanisms of retinal ganglion cell death in glaucoma. 2. To review new models used to test glaucoma neuroprotection. 3. To discuss the latest information from neuroprotection clinical trials, clinical measures of neuroprotection success, future considerations and applications to glaucoma patient care.

C28 DECISION MAKING AFTER FAILED TRABECULECTOMY

R. Carassa (chair), S.J. Gedde (chair), K. Barton, Y. Buys, K. Ishida

Objective: This course will discuss the preoperative assessment and surgical options for managing medically uncontrolled glaucoma in eyes that have had previously failed filtering surgery.

Description: The indications for glaucoma surgery will be discussed, along with the important aspects of the preoperative evaluation. Patient selection, surgical technique, and published outcomes will be reviewed for aqueous shunts,

trabeculectomy with the Ex-PRESS implant, Trabectome, and cyclophotocoagulation.

C29 CYCLOPHOTOCOAGULATION - WHY, WHEN AND HOW?

L. Shan (chair), P. Bloom (chair), M. Kahook

Synopsis: The role of cyclophotocoagulation has evolved recently to include use as a primary surgical therapy. Endoscopic cyclophotocoagulation has sparked interest as a potentially rapid glaucoma procedure often in combination with cataract surgery, with the possibility of fewer complications as compared to filtering surgeries. Even transscleral cyclophotocoagulation has been utilized as a primary procedure. The histopathological and vascular effects of each approach (endoscopic and transscleral) are different in severity.

Objective: To educate the general ophthalmologist or subspecialist in the techniques of transscleral and endoscopic cyclophotocoagulation; and to provide an update of the histopathology and indications for each procedure.

C30 MODULATING WOUND HEALING IN GLAUCOMA SURGERY

R.K. Parrish (chair), P.T. Khaw (chair), F. Grus (chair), M. Kahook, D.W. Lu, P.A. Netland, R. Pérez Grossman

Description: This course focuses on answering relevant questions on the modification of wound healing after glaucoma filtering surgery. Topics to be discussed include: the effect of biomaterial selection on wound healing, the determination of incision site – fornix vs. limbus based flaps, the possible role of anti-VEGF therapy and wound closure, decision making in for uveitic patients, the local preferences of one geographic area in South America for anti-scarring treatment, and the effect of postoperative manipulation of the filtering site on surgical success.

C31 UNDERSTANDING THE GENETIC BASIS OF GLAUCOMA: ITS ROLE IN CLINICAL PRACTICE

J. Wiggs (chair), D. Mackey (chair), S. Chakrabarthi, J. Craig, C.C. Pang

Description: A number of genes have been associated with human glaucoma including those causing rare early-onset disease (congenital glaucoma, developmental glaucoma and juvenile open-angle glaucoma) and those that are risk factors for common adult-onset glaucoma (primary open-angle glaucoma and exfoliation glaucoma). This course will discuss the role of these genetic factors in the glaucoma clinic, emphasizing the development of DNA-based screening, diagnostic and prognostic tests. Correlations between specific gene mutations and clinical phenotypes will also be presented.

C32 INTERPRETATION OF VISUAL FIELDS: DETECTION (DIAGNOSIS AND SELECTIVE TESTS)

F.J. Gofii (chair), R.S. Harwerth (chair), C.A. Johnson (chair), J. Flanagan, R.L. Stamper

Description: This course will review the different methods and strategies for detecting and interpreting glaucomatous visual field loss with standard automated perimetry (SAP) and non-SAP selective tests. The specific terminology used

in perimetry, a timeline overview of visual field testing development, criteria and algorithms more frequently used at the present moment by a selected panel of experts, the different classifications of damage, and the current role of non-standard automated perimetry will be presented and discussed.

C33 INTERPRETATION OF VISUAL FIELDS: PROGRESSION (RATES, EVENT VS. TREND)

F.J. Goñi (chair), R.S. Harwerth (chair), M. Fingeret, J. Flanagan, A. Iwase, R.L. Stamper

Description: This course will review the different methods and strategies for measuring and interpreting glaucomatous visual field progression with standard automated perimetry (SAP). The specific concepts and definitions, criteria and algorithms more frequently used to detect progression, including events and trends, and how to 1) estimate progression rates and their importance in clinical decision making, 2) put together progression and rate of progression in clinical practice, and 3) measure progression in advanced damage, will be presented and discussed.

C34 STEREOSCOPIC OPTIC DISC VIEWING: TOP-TEN PITFALLS IN IDENTIFYING GLAUCOMA DAMAGE AND PROGRESSION

A.H. Zalta (chair), K. Kashiwagi, G. Tomita, L. Wang

Objective: While viewing 3D optic disc images, participants will appreciate the complexities in identifying glaucomatous disc damage/progression and common optic disc anomalies/pathologies that confound our assessment of the glaucomatous disc.

Description: Attendees will wear red-blue glasses to view three-dimensional PowerPoint projections of stereoscopic optic disc images. The ten most common pitfalls confounding

our assessment of the glaucomatous disc, including optic disc swelling, atrophy, and anomalies (disc proper, peripapillary, and vascular) will be viewed, discussed, and correlated with visual field loss. Special emphasis will be placed on classic and progressive glaucomatous disc changes while viewing simultaneous projections of serial 3D images over time.

C36 Managing Cataract and Glaucoma-Surgical Management of Co-existing Cataract and Glaucoma

D. Lam (Chair), A.S. Crandall (chair), R. Fechtner, C.C.Y. Tham

Outline: This course presents the surgical strategies and options when managing patients with coexisting cataract and glaucoma. Surgical techniques to meet specific challenges in glaucoma patients with cataract will also be presented. The objective of the course is to assist attendees to develop good surgical strategies and choose the right techniques for patients with concomitant cataract and glaucoma.

C37- MANAGEMENT OF COMPLEX GLAUCOMAS

R. Susanna (chair), I. Goldberg (chair), Z. Burgansky-Eliash, D.E. Grigera, S.K. Fang, T. Howden, T. Shaarawy

Description: This course will cover the management of complex cases of glaucoma, where skill and deep knowledge of the disease complexity is necessary.

It is based on case presentations followed by panel discussion.

At the conclusion of this course the attendees will be aware of principles, technique and reasoning of everyday glaucoma practice.

SYMPOSIA

S01 ANGLE-CLOSURE GLAUCOMA

D.S. Friedman (chair), J. Ge (chair), R. Thomas (chair), T. Aung, A. Azuara Blanco, M. He, G. Gazzard, R. George, H. Quigley, C.C.Y. Tham

Outline: This session will cover the most recent findings as well as clinical recommendations related to angle closure and angle-closure glaucoma. Attendees will have a good understanding of what is now known and what questions remain unanswered regarding angle closure prevalence, risk factors, mechanisms, and management.

S02 ADVANCES IN IMAGING TECHNOLOGY AND APPLICATION (DETECTION, PROGRESSION, TECHNOLOGY, RISK ASSESSMENT)

J. Schuman (chair), F. Medeiros (chair), M. Hangai (chair), F. Cordeiro, J.G. Fujimoto, E.M. Hoffmann, A. Manassakorn, K.R. Sung, M. Vizzeri, L. Zangwill

Outline: Glaucoma imaging provides rapid, noninvasive, objective and quantitative measurement of ocular structure and function. The technologies used are robust and continue to evolve. Imaging in glaucoma is useful for detection of disease and assessment of progression. Imaging may provide clues as to the likelihood of future development of glaucoma, or the rate of glaucoma progression.

S03 GLAUCOMA PROGRESSION

D.S. Greenfield (chair), A. Heijl (chair), D.E. Grigera (chair), B. Bengtsson, R. Carassa, J.M. Liebmann, M. Nicoleta, K.H. Park, T. Yamamoto

Outline: Recent advances have improved our ability to detect glaucoma progression using standard perimetry and computerized optic nerve and retinal nerve fiber layer imaging. Different types of event and trend analyses have been developed for glaucoma monitoring and change detection. This course will summarize methods for detecting glaucomatous structural and functional progression, and address the clinical management of glaucoma progression.

S05 RISK FACTORS FOR GLAUCOMA ONSET AND PROGRESSION

B. Bengtsson (chair), T. Zeyen (Chair), D.Y.L. Leung (chair), C.G. De Moraes, P. Healey, L. Schmetterer, J.C. Tsai

Outline: Knowledge about risk factors for glaucoma onset is important for the management of patients with ocular hypertension and suspect glaucoma, and crucial if considering screening of selected groups of subjects. Risk factors for glaucoma progression are also of great interest to target treatment, particular at the time for diagnosis, when no information about rate of progression is available. This session will present the relevance of known and modifiable risk factors, and influence of lifestyle on risk factors for onset and progression of glaucoma. It will be concluded by a panel discussion.

S06 MYTHS AND MISCONCEPTIONS IN GLAUCOMA

R. Susanna (chair), R.A. Hitchings (chair), J. Schuman (chair), B. Chauhan, E. Dahan, M. Kahook, F. Medeiros, R.S. Parikh

Outline: "The great enemy of the truth is very often not the lie-deliberate, contrived and dishonest-but the myth-persistent, persuasive and unrealistic" (John F. Kennedy Presidential address, Yale University, June 11, 1962).

"Myths are those stories that have evolved in response to the great questions that concerned people, when human thought was not able to verify objective truth" (Can J Ophthalmol 2007; 42: 455-459).

Glaucoma knowledge, like science, has traversed a long road. Its genesis and development has occurred in all civilizations and in all corners of the world. Today glaucoma is a universal science but there is still myths and misconception related to the past as well as to the present, that may interfere with the best management of glaucoma. This symposium will address some of them in the most important areas of the glaucoma management.

S07 IOP MEASUREMENTS: PRESENT AND FUTURE

A.J. Sit (chair), D. Garway Heath (chair), G. Spaeth (chair), S. Asrani, M. Fingeret, R.P. Grossman, C.K.S. Leung, J.H.K. Liu

Synopsis: The measurement of intraocular pressure (IOP) is a critical component of glaucoma management. Despite its importance, routine clinical practice only assesses IOP during office hours on a periodic basis every few months. This provides an incomplete picture of the complex pattern of IOP. As well, despite inaccuracies that can result from variable ocular biomechanical properties, the Goldman applanation tonometer (a mechanical device developed 60 years ago) remains our gold standard for IOP measurement in the clinical setting. This symposium will focus on recent advances in our understanding of IOP patterns, improvements in technology for IOP measurement, and future devices for continuous monitoring of IOP.

S08 INITIAL TREATMENT FOR GLAUCOMA: MEDICAL VS LASER VS SURGERY

N. Pfeiffer (chair), G.D. McLaren (chair), G. Baerveldt, S. Gandolfi, F. Grehn, H. Thieme, F. Valtot

Outline: According to conventional wisdom glaucoma, when first diagnosed, is treated medically and if that fails it is followed by laser or surgery. However, the literature also suggests other sequences. So why do we still pursue the tradition? Will newer treatment options such as prostaglandins, selective laser trabeculoplasty or non-penetrating surgery change this? This symposium will address convention and new methods.

S09 LASER TRABECULOPLASTY FOR OPEN-ANGLE GLAUCOMA

S. Melamed (chair), J. Alvarado (chair), J. Zhao (chair), O. Geyer, M.A. Latina, R. Noecker, M. Wand

Outline: Laser Rx, especially the Selective Laser Trabeculoplasty (SLT), has become an accepted treatment modality for early and more advanced cases of Open Angle Glaucoma (OAG). In this session, certain important issues regarding the role of SLT in Glaucoma management will be presented and discussed. Should SLT be used as primary treatment or better utilized in other sub-types of glaucoma (like pseudoexfoliation Glaucoma) are some of the questions which will be debated.

S10 OCULAR BLOOD FLOW (PERFUSION AND WGA CONSENSUS)

A. Harris (chair), M. Araie (chair), J. Flammer (chair), V.P. Costa, I. Januleviciene, G. Michelson, J. Piltz-Seymour, R.N. Weinreb

Outline: In the recent 2009 World Glaucoma Association Meeting a consensus was agreed that vascular dysregulation may contribute to the pathogenesis of glaucoma and that more research should be done in terms of ocular perfusion pressure and blood flow for patients with glaucoma. Reduced ocular perfusion may be secondary to IOP elevation or represent a primary insult to the optic nerve in glaucoma. Chronic ocular ischemia may be due to vasospasm and/or the inability of the vasculature to overcome elevated IOP to maintain adequate perfusion (faulty vascular autoregulation). In large population based trials, reduced ocular perfusion pressure has been linked to both the prevalence and incidence and possibly progression of glaucoma. Directly measured blood flow deficiencies of the retinal, choroid and retrobulbar circulations have been reported in patients with OAG with a variety of imaging methodologies. Although pilot research has indicated vascular parameters are associated with glaucoma, their exact relationship to glaucoma progression both structural and functional remains insufficiently investigated.

S12 NEW IDEAS IN MEDICAL TREATMENT

A. Azuara Blanco (chair) H.G. Lemji (chair) M. Diestelhorst (chair), P.T. Khaw, M. Sherwood, A.J. Sit, R. Varma

Outline: In this symposium we will review the most promising approaches to better treat medically patients with glaucoma. Our increasing understanding of the role of intraocular pressure (IOP) and other factors has stimulated the development of new therapeutic approaches. Although IOP-lowering treatment with eye drops remains the most popular choice, poor adherence is a common and unresolved challenge. Can we efficiently improve our current care? Is it feasible to target other factors such as perfusion or neuroprotection? Should we use other delivery systems?

S13 CATARACT AND GLAUCOMA SURGERIES

D. Lam (chair), R. Bellucci (chair), T. Samuelson (chair), J.D. Brandt, A.S. Crandall, P. Palmberg, T. Shaarawy, K. Singh, R.L. Stamper, C. Tello, N. Wang

Synopsis: This symposium is jointly organized by the American Society of Cataract & Refractive Surgery (ASCRS), the European Society of Cataract & Refractive Surgeons (ESCRS), and the World Glaucoma Association (WGA). Leading experts from around the world will share their invaluable experience in tackling challenging cataract and glaucoma cases. The symposium will cover not just common but

also rare but interesting topics like cyclodialysis and its management. New glaucoma drainage devices, surgical tips for cataracts in different kinds of glaucoma patients and surgical tips for a variety of glaucoma surgeries will all be covered. All presentations are video-based so as to allow the audience a better understanding of the subjects.

S14 GENETICS (RESEARCH, CLINICAL APPLICATIONS)

J.L. Wiggs (chair), S. Chakrabarthi (chair), F. Jonasson (chair), J. Craig, D. Mackey, L.R. Pasquale

Synopsis: The identification of genes that contribute to common complex forms of glaucoma can translate into novel DNA-based screening tests, and novel therapeutics targeted to the underlying molecular events responsible for the disease. In this symposium the discovery of new genes contributing to common forms of glaucoma will be discussed, including the associated clinical phenotypes and the role of the gene product in glaucoma pathogenesis. A panel discussion will focus on how to meet the challenges faced when translating this information into clinically useful screening, diagnostic and prognostic tests and the development of novel therapeutics.

S17 GLAUCOMA DEBATES: HOT TOPICS (HAS GLAUCOMA MANAGEMENT IMPROVED IN THE LAST 10 YEARS?)

K. Singh (chair), P. Rojanapongpun (chair), M. Nardi (chair), R. Brown, R. Fechtner, R.L. Fellman, F.J. Goñi, D.S. Greenfield, A. Heijl, C.K.S. Leung, K. Martin, R.K. Parrish, N. Pfeiffer, R.L. Stamper, C.E. Traverso

Outline: This symposium will provide different perspectives on the present and future clinical management of glaucomatous disease in a debate format. As the speakers have been given assigned positions, their comments are made for the purpose of debate and may or may not reflect their own views on the assigned topics.

S23 GLAUCOMA & MYOPIA

J.B. Jonas (chair), T. Aung (chair), L. Shan (chair), D.L. Budenz, M. Hangai, B. Mani, K. Singh

Outline: This symposium covers the diagnosis of glaucoma in the medium and highly myopic eyes, explains the difficulties in the diagnosis of myopic glaucoma, presents results of population-based studies on the increased glaucoma prevalence (and susceptibility) in highly myopic eyes, describes aspects of the biomechanics of the myopic optic nerve head, and shows histological findings potentially explaining the elevated glaucoma susceptibility in highly myopic globes.

S24 EXFOLIATION SYNDROME AND EXFOLIATIVE GLAUCOMA

R. Ritch (chair), H. Tanihara (chair), K. Barton, K. Csiszar, G. Hollo, A.G.P. Konstas, U. Schlötzer-Schrehardt, C. Tello

Outline: Excitement surrounding exfoliation syndrome (XFS) based on evolving knowledge of its pathobiology, genetics, LOXL1 enzymatic structure, roles of elastic tissue and the extracellular matrix, and associated ocular and systemic disorders and discovery of biomarkers reflects the possibility of new and more specific therapeutic approaches, reversal of

damage and eventual cure. Lysyl oxidases are essential for elastic tissue formation and maintenance. An emerging spectrum of associations (cardio- and cerebrovascular disease, Alzheimer's, hearing loss) indicates a condition of general medical importance. Elevated TGF- β 1 interacts with lysyl oxidase to influence elastic tissue formation and appears responsible for production of exfoliation material.

S25 UPDATE ON CONSENSUS REPORTS

J.M. Liebmann (chair), A. Araie (chair), F. Lerner (chair), C.K.S. Leung, F. Medeiros, T. Wong

Synopsis: The World Glaucoma Association held a consensus meeting on the Medical Treatment of Glaucoma in May, 2010. For several months, more than 200 leading glaucoma experts from throughout the world contributed to extensive on-line discussions, interaction at the consensus meeting, development of consensus statements, and creation of the final consensus documents. This consensus project was chaired by Prof. Robert N. Weinreb, along with co-chairs Prof. Makoto Araie, Jeffrey Liebmann, Clive Midgal, and Remo Susanna. This symposium will highlight the key consensus statements.

S27 GLAUCOMA MANAGEMENT IN DEVELOPING WORLD

L.W. Herndon (chair), R. Sihota (chair), K. Ben Amor (chair), E. Ancker, J.E. Standefer, L. Vijaya

Outline: Glaucoma is the second leading cause of world blindness, yet it is not included in many international and national plans, due to a lack of standardized diagnostic criteria, complexity of diagnosis, impracticality and cost of therapy in many settings, and failure to demonstrate personal and societal benefit from treatment. Although there is increasing evidence that pressure-lowering treatment is sufficiently effective under ideal conditions, for most of the developing world, no therapy has been proven effective using standard scientific evaluation. With this symposium, we plan to re-examine the global burden of glaucoma and to offer solutions to the complex problem of caring for those who have glaucoma in environments where there are limited resources.

S28 INNOVATIVE APPROACHES FOR PROTECTING THE RETINAL GANGLION CELLS

K. Martin (chair), H. Levkovitch-Verbin (chair), R.N. Weinreb (chair), J.G. Crowston, N. Gupta, P.L. Kaufman, F. Medeiros, J.E. Morgan, J.A. Sahel, L. Wheeler, J.L. Wiggs

Outline: Although effective neuroprotection of retinal ganglion cells by methods other than reduction in intraocular pressure remains an elusive goal, a variety of different approaches show great promise for the future. In this session, we will review some of these approaches, ranging from gene therapy and protection of axons and mitochondria to the possibilities of therapy targeted to the brain as well as the eye. Clues to neuroprotective strategies derived from large genetics studies will be reviewed and the session will conclude with consideration of the obstacles need to be overcome to achieve successful clinical trials of neuroprotection in glaucoma.

S30 THE MOST EXCITING CONTRIBUTIONS TO GLAUCOMA IN THE LAST FIVE YEARS

S. Melamed (chair), P. Chew (chair), J. Schuman (chair), K. Barton, F. Cordeiro, J. Danias, J.G. Fujimoto

Outline: This is a special session devoted to the most important contribution to glaucoma in the last ten years. The unique contribution could be in the field of basic research, diagnosis, treatment and pathogenic mechanisms related to glaucoma. The choice of the five best contributions was made by vote of key opinion leaders from all over the globe.

S33 GLAUCOMA: THE PATIENT'S ANGLE (WGPA, PATIENT PERSPECTIVE)

I. Goldberg (chair), G.N. Lambrou (chair), E. Ancker (chair), P.Y. Ramulu, G. Spaeth

Outline: In the management of a chronic, progressive, potentially blinding condition like glaucoma, in which damage caused is irreversible, patient participation in management is indispensable to protect vision. Such patient participation requires awareness, realistic expectations and an alliance between patient and ophthalmologist. To develop such an alliance, ophthalmologists must be aware of the patient's perspective.

Glaucoma patient quality of life, of adherence, perseverance, and dyscompliance, and appropriate involvement with patient support associations are vital for a successful alliance.

This Symposium will tackle the challenges to glaucoma management that every ophthalmologist must understand to be effective for patients.

S34 REGENERATIVE MEDICINE IN THE 21st CENTURY – CAN WE REPAIR THE GLAUCOMATOUS EYES?

J.D. Brandt (chair), R. Burk (chair), Y. Kuwayama (chair), F. Cordeiro, J.D. Lindsey, D.J. Rhee, Y. Yucel

Outline: The new field of regenerative medicine holds the promise of repairing diseased organs at the cellular and molecular level using stem cells, gene repair and nanotechnology. Will we be able to repair the glaucomatous eye in the future?

In this symposium we have asked experts in several disciplines central to regenerative medicine to predict where we will be in twenty years. The talks in this session are designed to be highly speculative, describing where, in the speakers' fondest hopes, we may be some twenty years from now. As a whole, the talks will summarize work in ophthalmic regenerative medicine in the context of the larger field (e.g., Stem cell delivery to target organs, CNS repair and stroke/spinal cord injury repair) and the many challenges that must be met and overcome to make repair of the glaucomatous eye a reality.

S35 GLAUCOMA AND COEXISTING DISEASES (CORNEA-DSEK, PKP, KERATOPROSTHESIS, RETINA, OCULAR SURFACE AND INFLAMMATION)

E.Z. Blumenthal (chair), A. Iwase (chair), J.C. Tsai (chair), M.B. Agulto, C. Baudouin, S. Best, Y. Buys, C. Kee, D.W. Lu, R. Mills, D.J. Rhee

Synopsis: Glaucoma is not a simple disease to manage. This becomes exponentially harder when an eye harbors

more than just glaucoma. In this WGC symposium, we will try to tackle some of the more difficult combinations that appear infrequently in our waiting rooms. Experienced clinicians will attempt to highlight what they perceive as 'safe ground', and where potential 'landmines' might be hiding just under the surface. In this symposium, your distinguished colleague's worst nightmares turn into entertainment for you.

S40 PEDIATRIC GLAUCOMA

A. Beck (chair), A.K. Mandal (chair), J. Alvarado, J.D. Brandt, R.L. Fellman

- I. Classification – The two most common forms of pediatric glaucoma will be the main focus of this symposium.
 - A. Primary congenital (infantile) glaucoma.
 - B. Glaucoma associated with congenital cataract surgery.
- II. Genetics of primary congenital glaucoma – correlation of known genotypes with phenotypic presentation.

Specific CYP1B1 mutations may be associated with more severe angle dysgenesis and be refractory to surgical intervention.

III. Management.

- A. Medical – Most cases of pediatric glaucoma still need a medication trial prior to going to surgery. Primary congenital glaucoma is the main exception due to the good surgical prognosis and poor response to medical therapy. Adjunctive medical therapy is commonly required following surgical intervention. Life-long follow-up of primary congenital cases is mandatory as glaucoma may recur many years following successful angle surgery.
- B. Surgical – Certain aspects of the surgical management of pediatric glaucoma will be presented.
 1. Trabeculotomy including use of the iTrack catheter.
 2. Combined trabeculotomy-trabeculectomy.
 3. Glaucoma drainage devices.
 4. Cyclodestruction.

FREE-PAPER SESSIONS

S15 FREE PAPER SESSION

FP1 THE VELOCITY OF VISUAL-FIELD PROGRESSION IN EYES WITH OPTIC-DISC HEMORRHAGES IN THE OCULAR HYPERTENSION TREATMENT STUDY

S. Demirel¹, S. Gardiner¹, J. Liebmann², R. Ritch³, G. Cioffi¹, M. Kass⁴, M. Gordon⁴, G. De Moraes²

¹Devers Eye Institute, Portland - USA; ²New York University School of Medicine, New York - USA; ³New York Eye and Ear Infirmary, New York - USA; ⁴Washington University School of Medicine, St Louis - USA

Purpose: To determine rates of visual field (VF) change in eyes with and without optic disc hemorrhage (DH) detected on stereophotographs and to determine whether the rate of VF change is influenced by DH recurrence.

Methods: We included OHTS participants with ≥ 10 reliable VF tests and ≥ 5 years of follow-up. Eyes reaching endpoints considered non-glaucomatous by the OHTS endpoint committee were excluded (261 eyes of 202 participants). Optic disc stereophotographs were reviewed for the presence of DH. VF progression was assessed using 2 methods of trend-analyses: 1) regression of mean deviation over time to determine its rate of change (MDR), and 2) point-wise linear regression (PLR) in which the sensitivity at each VF location (30-2 pattern) was regressed over time. For PLR, a progression endpoint was defined as a slope ≤ -0.5 dB/yr with $p \leq 0.01$ at ≥ 1 location, ≥ 2 locations or ≥ 2 neighboring locations.

Results: Data from 2,607 eyes of 1,378 participants were included. The mean number of VF tests in a test sequence was 23.7 ± 4.9 spanning an average of 12.2 ± 2.0 years. At least one DH was detected in 187 eyes (7.2%). 135 eyes had 1 DH and 52 eyes had >1 DH. The MDR was significantly worse in DH compared to non-DH eyes (-0.17 ± 0.19 vs. -0.07 ± 0.27 dB/yr, $p < 0.01$). Eyes with a single DH and eyes with recurrent DH were not significantly different in their MDR (-0.16 ± 0.29 dB/yr vs. -0.20 ± 0.18 dB/yr, $p = 0.29$). There was a significant association between DH and progression endpoints determined using PLR by all three criteria described above (Ors = 3.6, $p < 0.01$; 2.8, $p < 0.01$; 2.5, $p < 0.01$ respectively (logistic generalized estimating equations)). In contrast to the MDR results, eyes with ≥ 2 DH were significantly more likely to display PLR progression by all 3 criteria described above than eyes with only 1 DH (Ors = 4.2, $p = 0.01$; 3.4, $p < 0.01$; 3.6, $p < 0.01$ respectively).

Conclusions: Eyes with one or more DH during follow-up had more rapid VF deterioration when assessed by global (MDR) or local (PLR) methods when compared to eyes without DH. Eyes with recurrent DH had statistically similar rates of global VF change (MDR) when compared to eyes with a single DH, but reached PLR endpoints more often.

FP2 CORNEAL SENSITIVITY IN PATIENTS TREATED FOR GLAUCOMA OR OCULAR HYPERTENSION

C. Van Went¹, H. Alalwani¹, E. Brasnu¹, J. Pham¹, P. Hamard¹, C. Baudouin¹, A. Labbe¹

¹Centre National d'Ophthalmologie des Quinze-Vingts, Paris - France

Background: The use of topical IOP-lowering medications is associated with numerous ocular surface changes. Previous studies have suggested that topical anti-glaucoma treatments may affect corneal sensitivity. The purpose of this study was to evaluate the corneal sensitivity in patients treated with IOP-lowering medications and the influence of preservatives.

Methods: Thirty-nine patients treated for glaucoma or ocular hypertension (OHT) and 9 untreated patients were included in this study. Patients treated with intraocular pressure-lowering medications were divided in 3 groups according to the number of instillations of preserved eyedrops (0, 1 and ≥ 2). Corneal sensitivity was assessed using the Cochet-Bonnet esthesiometer. Then, all patients underwent a complete examination of the ocular surface including Schirmer test, tear film breakup time (TBUT) and, corneal and conjunctival fluorescein staining. The Ocular Surface Disease Index (OSDI) questionnaire was used to evaluate symptoms.

Results: The corneal sensitivity was 58.8 ± 2.8 mm, 56.2 ± 5.2 mm, 50.3 ± 12.5 mm and 44.3 ± 13.6 mm in untreated patients, in patients treated with 0, 1 and ≥ 2 instillations of preserved eye drops, respectively. The corneal sensitivity of patients treated with preserved eye drops was significantly lower as compared to untreated patients ($p < 0.001$) and patients treated with preservative-free eye drops ($p = 0.012$). The corneal sensitivity of patients treated with intraocular pressure-lowering medications was negatively correlated to the number of instillations of preserved eye drops ($r = -0.390$; $p < 0.001$) as well as to the duration of treatment ($r = -0.357$; $p = 0.001$).

Conclusion: The chronic administration of eye drops containing preservatives may decrease corneal sensitivity. These results could explain the absence of correlation between symptoms and signs sometimes observed in patients treated for glaucoma or OHT.

FP3 MITOCHONDRIAL DAMAGE IN THE TRABECULAR MESHWORK OF GLAUCOMATOUS PATIENTS

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Oxidative damage to the trabecular meshwork is a pathogenic mechanism contributing to glaucoma. The source of this oxidative stress still remains to be identified. Since no environmental risk factors for glaucoma is recognized, we focused our attention on mitochondria, the main endogenous source of reactive oxygen species. Mitochondrial damage was evaluated analysing the common mitochondrial DNA (mtDNA) deletion by real-time PCR in the trabecular meshwork of 79 primary open-angle glaucomatous patients and 156 unaffected controls collected at surgery. Glaucomatous patients included patients affected by various glaucoma types: primary open-angle, pigmented, juvenile, congenital, pseudoexfoliative, acute, neovascular, and chronic closed-angle glaucoma.

MtDNA deletion was dramatically increased in trabecular meshwork of glaucomatous patients *versus* controls. This

finding was paralleled by a decrease in the number of mitochondria per cell and by cell loss. Only primary open-angle glaucoma (3.0-fold) and pseudoexfoliative glaucoma (6.3-fold) showed significant increases in the amount of mitochondrial DNA deletion. In all other cases, deletion was similar to controls. The results obtained indicate that the mitochondrion is a target for the glaucomatous degenerative processes selectively involved in the pathogenesis of primary open-angle glaucoma and pseudoexfoliative glaucomas.

FP4 ASSESSMENT OF RETINAL AND OPTIC NERVE HEAD BIOMARKERS FOR PREDICTION OF THE CIRCUMPAPILLARY RETINAL NERVE FIBER PROFILE

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Background: To define an accurate normative database for glaucoma detection based on the correlation of TSNIT profiles with putative morphological biomarkers.

Methods: A sample of 120 healthy volunteers underwent complete ophthalmologic examination, including HR-OCT scanning (Cirrus® Carl Zeiss Meditec Inc.) and RNFL Assessment (GDx-ECC® Carl Zeiss Meditec Inc.). The direction of the major retinal vessels near the optic nerve head was proven to be a good predictor of the TSNIT profile. To confirm this and establish retinal and optic disc parameters as biomarkers for the TSNIT profile, SLO-OCT images centered at the optic disc will be processed for automatic segmentation of vessels and optic disc. All extracted putative biomarkers will be analyzed to determine their relevance for the TSNIT profile. To test this model, a preliminary analysis was performed using a subsample of 79 subjects. TSNIT profiles from GDx were parameterized using Discrete Wavelet (DWT) and Discrete Fourier Transforms (DFT). The results were correlated with the major superior and inferior vessel angles (manually segmented).

Results: A good correlation was obtained between retinal vessel angles and DWT coefficients. The 2nd and the 5th detail coefficients present better correlation with the superior major vessel ($R = -0.47$, $R = -0.48$, $p < 0.05$), while 8th and the 10th approximation coefficients present a better correlation with the inferior major vessel ($R = -0.38$, $R = -0.40$, $p < 0.05$). The 2nd and 4th values of amplitude of the DFT coefficients present good correlations with the superior and inferior vessel angles ($0.38 < R < 0.55$, $p < 0.05$), as well as the 2nd and 4th values of power ($0.35 < R < 0.50$, $p < 0.05$).

Conclusions: The results confirm a relation between the angles of the retinal blood vessels and TSNIT profile. This validates Wavelet and Discrete Fourier transforms as approaches to determine possible morphological biomarkers for the prediction of the TSNIT profile. This study is considered a step forwards on individualized normative data concerning RNFL. Determining independent biomarkers may compensate for the intersubject variability of RNFL measurements and might render the normative values of retinal nerve fiber measurements more accurate.

FP5 NON-INVASIVE THREE-DIMENSIONAL (3D) SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY (SDOCT) CASTING OF THE AQUEOUS OUTFLOW SYSTEM

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Purpose: Aqueous exiting the eye via the trabecular meshwork/Schlemm's canal (SC) passes through the deep and intrascleral venous plexus (ISVP) or directly through aqueous veins. The purpose of this study was to visualize the human aqueous outflow system 360 degrees in 3D during active aqueous outflow.

Methods: During perfusion at different pressures, the outflow pathways of 7 donor eyes were imaged with a modified SDOCT system (Bioptigen Inc, USA; SuperLum LTD, Ireland). Thirty-six scans (3 equally distributed in each clock hour), each covering a 2 x 3 x 2 mm volume (512 frames, each 512 x 1024 pixels), were obtained from each eye (Figs. A and B). All image data were black/white inverted, and the background subtracted (Subtract Background algorithm, ImageJ 1.40g, <http://rsb.info.nih.gov/ij/>). Contrast was adjusted to isolate the ISVP.

Results: SC, collector channels, the deep and ISVP, and episcleral veins were observed in different regions of limbus. Aqueous veins could be observed extending from SC towards the ISVP (B). Individual scan ISVP castings were rendered (C) and assembled in 3D space (D) in Amira 4.1 (Visage Imaging Inc. USA). A 360-degree casting of the ISVP was obtained in all perfused eyes. The ISVP tended to be dense and overlapping in the superior and inferior quadrants, and thinner in the lateral quadrants.

Conclusions: The human aqueous outflow pathway can be imaged using SDOCT. The more superficial structures of the aqueous outflow pathway present with sufficient contrast as to be optically isolated and non-invasively cast in-situ 360 degrees in cadaver eye perfusion models. This approach may be useful in future studies as a model of human aqueous outflow.

FP6 SOCIO-DEMOGRAPHIC FACTORS THAT IMPACT ON COST OF CARE FOR INCIDENT OPEN-ANGLE GLAUCOMA

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Background: Little is known about the cost of treating newly-diagnosed open-angle glaucoma. Most information on cost has been based on prevalent glaucoma, and the capture of costs was confined to one point in time. The purpose of our study was to identify enrollees in a large health care plan who had newly diagnosed OAG, obtain costs of their glaucoma care over a two-year period, and evaluate socio-demographic factors that impacted on cost of care.

Methods: We identified patients with incident OAG from a large, national, managed care network in the US (the i3 InVision Data Mart dataset; Ingenix, Eden Prairie, MN). The dataset contains fully de-identified records of all beneficiaries. We had access to data for a subset of beneficiaries who had any form of eye care from January 1, 2001 through December 31, 2009. Incident glaucoma was identified by identifying enrollees who had no coding for OAG from eye care visits during a one-year look-back period preceding the first diag-

nostic coding for OAG. Resource use for glaucoma care over the two year post-diagnosis period included glaucoma-related medication, surgery, office visits, and diagnostic testing. Socio-demographic variables (age, sex, race, education level, household net worth and region of residence) were associated with total glaucoma charges by a multivariable linear regression model. An estimate of glaucoma severity and systemic co-morbidity burden were included as covariates in the model.

Results: A total of 19,927 enrollees met our definition of incident OAG. These patients had a mean (standard deviation) age of 60.2 (11.0) years and were more likely to be female (55.2%). Most people with incident OAG were white (81.4%) followed by Blacks (8.3%), Latino's (6.5%), and Asians (3.0%). Almost all were high school graduates (98.3%) and 24.7% had graduated from college. The majority of the enrollees with incident OAG (75.4%) had household net worth levels of > \$150,000. Over the first two years after OAG diagnosis, a total of \$42.3 million was spent on glaucoma-related care. The median cost of care was \$1,516, with an interquartile range from \$801 to \$2,547. Factors strongly predictive of two year cost of care (all p-values < 0.0001) included age (lower costs among the youngest and oldest), sex (females > males), region of country (NE highest), and expected increases with worsening glaucoma severity and more systemic co-morbidities. Household net worth, education, and race were also significantly associated with two-year costs. The regression model predicted that two-year cost of care for a 60 year-old with incident OAG would vary from \$1762 for a black male to \$2139 for an Asian female, with other race/sex combinations falling between these estimates.

Conclusions: Socio-demographic factors impact strongly upon cost of care for incident OAG, even after adjusting for the severity of glaucoma and systemic co-morbidities. Knowledge of these associations may lead to identifying underlying factors that create discrepancies in not only cost, but also effectiveness of care.

C38 FREE PAPER SESSION

FP7 MORPHOLOGICAL CHANGES OF LATERAL GENICULATE NUCLEUS IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA: A 3.0T MAGNETIC RESONANCE IMAGING STUDY

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Background: Recently, more and more studies indicate that the glaucomatous damage not only occurred to retinal ganglion cells in the eyes, but went across optic nerves, visual chiasm, lateral geniculate nucleus (LGN) and finally the visual cortex, similar to the neurodegenerative diseases, such as Alzheimer's disease. LGN works like a relay station in the visual nerve system. Results from previous experiments on primates (pressure-induced glaucoma monkey models) have shown atrophies and shrinkage in both LGNs. In this report, morphological changes of LGN in patients with moderate to severe primary open-angle glaucoma (POAG) were investigated by 3.0-Tesla magnetic resonance imaging.

Methods: Eighteen patients with moderate to severe POAG,

and eighteen age and gender matched healthy subjects underwent MRI examinations. LGN was identified and manually extracted by two experienced neuroradiologists. The maximum height and volumes of the bilateral LGNs were measured. The patients and controls were compared with a t test.

Results: Bilateral LGNs could be visualized clearly by 3.0T MRI. The mean maximum height of the right LGN was 4.18 ± 0.53 mm for patients and 5.01 ± 0.40 mm for controls, while that of left LGN was 4.15 ± 0.55 mm for patients and 4.96 ± 0.40 mm for controls. The combined LGN height was 8.33 ± 1.05 mm for patients and 9.97 ± 0.73 mm for normal subjects. For volumes, the mean right LGN was 86.6 ± 15.0 mm³ in patients whereas it was 148.4 ± 19.5 mm³ in controls, the left one was 83.4 ± 17.9 mm³ in patients and 149.3 ± 13.5 mm³ in controls, the combined LGN volumes of patients and controls were 169.9 ± 29.0 mm³ and 297.7 ± 29.2 mm³ respectively.

Conclusions: Bilateral LGNs could be clearly visualized by 3.0T MRI, both the heights and volumes of LGN decreased significantly in patients with POAG than the normal subjects. The morphological changes, especially changes in the LGN volumes, provided an efficient and reliable biomarker for the clinical observations on central nerve system damages in glaucoma.

FP8 OCULAR SURFACE CHANGES IN GLAUCOMA PATIENTS TREATED WITH FIXED COMBINATIONS OF PROSTAGLANDINES/TIMOLOL 0.5%

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Purpose: To compare ocular surface changes induced by glaucoma treatment in patients using fixed combination of prostaglandine analogues (latanoprost, travoprost and bimatoprost) and timolol maleate 0.5%.

Methods: Thirty-three patients with ocular hypertension or open-angle glaucoma not receiving treatment were included in the investigation. Exclusion criteria: previous ocular surgeries, ocular inflammation, dry eye or multiple glaucoma treatment. Ocular surface evaluation was done before and 3 months after fixed combination treatment with Xalacom (XC), Duo-Travatan (DT) and Ganfort (GF). Slit lamp biomicroscopy, break up time (BUT), Schirmer Tear Test (STT) and Lisamine Green Test 1% (LGT) quantified by the Bijsterveld scale were performed in all patients, who also answered the OSDI form. After the ophthalmic examination, impression cytology was done and the samples underwent HE, PAS and immunohistochemistry staining with antibodies against IL-6 and HLA-DR.

Results: All drugs induced a STT reduction, but it only was significantly different in the groups DT ($p < 0.0001$) and XC ($p < 0.0007$). Comparing all drugs, DT induced greater reduction compared to GF ($p = 0.0034$) and XC ($p = 0.04$). BUT decreased in the DT group ($p = 0.0125$) and in the XC group ($p = 0.035$), and the difference of DT group was significant when compared to GF ($p = 0.0007$) and XC ($p = 0.0008$). LGT score increased significantly in DT ($p = 0.9999$) and GF ($p = 0.0063$), and it was also significant comparing DT to GF ($p = 0.0001$), DT to XC ($p = 0.0001$) and GF to XC ($p = 0.0001$). OSDI Scores increased in all treatment groups, but

only with DT it was significantly different (higher) ($p = 0.02$). XC presented the lowest scores. The OSDI Scores for DT were worse than for GF ($p = 0.0095$) and XC ($p < 0.0001$) and XC scores were better than GF ($p < 0.0001$). All drugs induced a significant IOP reduction ($p < 0.0001$). GF ($p = 0.013$) and XC ($p = 0.0021$) demonstrated a greater reduction comparing to DT. Immunohistochemistry results showed an over-expression of inflammatory cells (IL-6 and HLA-DR) in all treated groups. After treatment DT presented a higher HLA ($p = 0.0184$) and IL-6 ($p = 0.0023$) expressions. Comparing groups for HLA expression, in the DT group it was significantly higher than in the XC group ($p = 0.0036$) and in the GF group it also was significantly higher than in the XC group ($p = 0.007$). For IL6 expression, the GF group presented more positive cells than the XC group ($p = 0.0132$) post-treatment. Total impression cytology scores showed a deterioration of ocular surface conditions in all groups post-treatment (54.54% to XC and DT, and 45.45% to GF) with no significant difference among drugs. Other specific parameters changed as cellularity, which was considered *borderline* or *abnormal* in all groups (DT $p = 0.0008$; GF $p = 0.008$ and XC $p = 0.0022$), with a significant difference when comparing GF (which was worse) to DT ($p = 0.0486$). Cell-to-cell contact decreased significantly only in DT group ($p = 0.0005$). Nucleus-cytoplasm ratio tended to increase in all groups but it was only significantly different when comparing DT to GF ($p = 0.0131$) and to XC ($p = 0.0483$). Goblet cells density increased in all groups, being significantly higher in the DT group ($p = 0.0012$) and XC ($p = 0.0186$). Comparing drugs, GF significantly increases this cells comparing to XC ($p = 0.0425$). There were no signs of inflammatory cells or keratinization.

Conclusions: All drugs induced a significant IOP reduction. Fixed combinations increase expression of inflammatory markers such as HLA-DR and IL-6. Some drugs may induce fewer changes than others in some parameters but all of them worsened ocular surface conditions during glaucoma treatment.

FP9 MEASUREMENT OF TNF-ALPHA, INTERLEUKIN-6, FASL, INTERLEUKIN-1 ALPHA AND INTERLEUKIN-1 BETA IN THE AQUEOUS HUMOR OF PATIENTS WITH OPEN-ANGLE GLAUCOMA USING MULTIPLEX BEAD ANALYSIS

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Background: Various cytokines have been demonstrated to contribute to the pathogenesis of glaucomatous damage. Upregulation of TNF- α in optic nerve heads and retina sections of glaucomatous eyes has been shown in *ex-vivo* studies, while an *in vitro* study provided evidence that glial cells exposed to elevated hydrostatic pressure or stimulated ischemia secreted increased amounts of TNF- α . Endothelial leukocyte adhesion molecule-1 (ELAM-1) is a cell-adhesion molecule consistently present in the outflow region of glaucomatous eyes, while being absent in the outflow region of normal eyes. Expression of ELAM-1 has been suggested to be under control of interleukin-1 α (IL-1 α), interleukin-1 β (IL-1 β), and interleukin-6 (IL-6). Furthermore, in an *in-vitro* study using co-cultured retinal astrocytes, microglia and RGCs, IL-6

has been shown to counteract pressure-induced apoptotic death of RGCs. Decreased cellularity of the trabecular meshwork has been reported in glaucomatous eyes and this cell loss has been suggested to be due to apoptotic death via the Fas/FasL pathway. Multiplex bead analysis has the advantage of measuring a large number of analytes in parallel in relatively small volumes, as they are typically provided in ophthalmologic samples from the aqueous humor, vitreous or tear fluid. The present study was set to investigate concentrations of the aforementioned cytokines (TNF- α , FasL, IL-1 α , IL-1 β and IL-6) in the aqueous humor of patients with POAG using a multiplex bead analysis.

Methods: Twenty-five patients with POAG and 29 control subjects were enrolled in this case-control study. The study was approved by the Institutional Review Board of the Medical University of Graz. Prior to enrollment, written informed consent was obtained from all participants. POAG was defined by an open anterior chamber angle, optic disk changes characteristic for glaucoma, visual field defects characteristic for glaucoma and absence of conditions leading to secondary glaucoma. The control group consisted of 29 unrelated patients with no morphological or functional damage indicative for primary or secondary open angle or angle-closure glaucoma. Aqueous humor was collected via limbal paracentesis using a blunt 30 gauge cannula at the beginning of the surgery, and was placed immediately on ice. Determination was done using BD™ CBA Flex Set System. The assay sensitivities were as follows: IL-1 α 6.54 pg/ml, IL-1 β 1.74 pg/ml, IL-6 1.87 pg/ml, FasL 2.05 pg/ml, and TNF- α 1.95 pg/ml.

Results: Concentrations of IL-1 α , TNF- α , and FasL were below limits of detection. IL-1 β was detected in 6 patients and 5 controls with mean concentrations of 0.5 and 0.4 pg/ml, respectively ($p = 0.72$). IL-6 was detected in 10 (out of 25) patients and 22 (out of 29) controls. The mean concentration was 9.3 pg/ml in patients and 55.9 pg/ml in controls, respectively ($p = 0.003$). No significant correlation was found between IL-6 and age, duration of disease, cup/disk ratio, or mean deviation.

Conclusion: We observed significantly lower concentrations of IL-6 in the aqueous humor of patients with POAG compared with control subjects. As studies provided evidence that IL-6 protects RGC's from pressure-induced apoptotic death and after ischemia/reperfusion injury, lower intraocular concentrations of IL-6 may increase the likelihood of RGC damage.

FP10 EFFECTIVITY OF THE BAERVELDT GLAUCOMA IMPLANT IN PATIENTS WITH SECONDARY GLAUCOMA DUE TO UVEITIS

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Background: Patients with secondary glaucoma due to uveitis are at high risk of failure after conventional glaucoma filtering surgery and usually require more interventions to maintain adequate intraocular pressure (IOP). The objective of this study was to evaluate the effectivity of the Baerveldt glaucoma implant in patients with secondary glaucoma due to uveitis.

Methods: Case series in which we prospectively studied uveitis patients who underwent Baerveldt glaucoma implant surgery due to refractory secondary glaucoma. In all cases

a Baerveldt 350 mm² glaucoma implant was placed in the anterior chamber. Twenty-eight eyes of 26 patients were included. Pre-operatively, an extensive ophthalmologic examination was performed including endothelial cell density (ECD) count and OCT Visante imaging of the anterior eye segment. The ECD was compared with a group of 20 POAG patients for all follow-up moments. Follow-up visits were scheduled 1, 3, 6 and 12 months post-operatively.

Results: The mean age of the included patients was 51 ± 19 years, 50% were male. The causes of uveitis were diverse: 4 patients suffered from sarcoidosis, 5 patients had Fuchs' heterochromic uveitis, 2 patients had HLA-B27 positive uveitis and 2 patients suffered from juvenile idiopathic arthritis. Four of the 26 patients were treated with adalimumab, 3 patients with methotrexate and 2 patients used oral prednisone. Mean IOP was 28.1 ± 8.7 mmHg pre-operatively. After one month follow-up mean IOP was 17.8 ± 9.6 mmHg; after 3 months 12.7 ± 5.1 mmHg; after 6 months 12.3 ± 5.3 mmHg and after 1 year 10.8 ± 4.8 mmHg. The mean ECD was 2216 ± 541 pre-operatively. After three months of follow-up the mean ECD was 2147 ± 627 ; after 6 months 1874 ± 510 and after 12 months the mean ECD was 2112 ± 644 . There was no statistically significant difference in ECD count between the uveitis patients and the POAG patients at all follow-up moments. After one year, the mean ECD in POAG patients was 2340 ± 713 . One eye developed a late hypotony (3 mmHg after a year follow-up) but without hypotonic maculopathy. In one eye, the tube was reinserted into the pars plana because of tube-corneal touch 12 months post-operatively.

Conclusion: The Baerveldt glaucoma implant is an effective and relatively safe procedure for the treatment of refractory secondary glaucoma due to uveitis.

FP11 MULTI-CENTER GLAUCOMA SCREENING IN ISRAEL DURING THE 2010 WORLD GLAUCOMA DAY

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Background: Early detection of glaucoma enables beginning of therapy at an earlier stage, and may improve outcome. Screening of large populations at risk is likely to help in achieving this goal.

Methods: A public-awareness campaign was carried out in electronic and paper media in Israel during the 2010 World Glaucoma Week, culminating in a one-day, free-of-charge screening of individuals in twelve outreach locations throughout Israel. Cases with a prior diagnosis of glaucoma or ocular hypertension were excluded. Screening was performed by 30 ophthalmologists, members of the Israel Glaucoma Screening Group, and included medical history, slit-lamp exam, including gonioscopy and intraocular pressure (IOP), and fundus exam with evaluation of cup/disc ratio. When necessary, further evaluation at an ophthalmology clinic was recommended.

Results: 1296 individuals were screened, 702 females and 594 males. All were older than 30, mean age was 60 ± 12 . The table shows the number of eyes and cases with elevated IOP and with enlarged cupping. The number of cases with both IOP ≥ 21 and cupping ≥ 0.5 , apparently suggestive of preperimetric glaucoma, increased with age: it was found in 20 cases aged ≥ 50 years (1.9%), compared to none among

younger individuals ($p = 0.04$). Likewise, cupping ≥ 0.7 was observed in 5.6% of those aged ≥ 50 , compared to only 1.8% of younger individuals ($p = 0.02$). The combined IOP ≥ 21 and cupping ≥ 0.5 was significantly more common in women compared to men (2.4% and 0.5% respectively, $p = 0.01$). Further ophthalmological evaluation was recommended to 185 of the screened individuals (14.2%).

Conclusion: Outreach screening for glaucoma is a valuable tool for detecting glaucoma or ocular hypertension in a meaningful number of previously undiagnosed cases. The yield of such screening is increased in those older than 50 and in women.

FP12 COMBINING STRUCTURAL AND FUNCTIONAL MEASUREMENTS TO IMPROVE DETECTION OF GLAUCOMA PROGRESSION USING BAYESIAN HIERARCHICAL MODELS

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Purpose: To present and evaluate a new methodology for combining longitudinal information from structural and functional tests to improve detection of glaucoma progression and estimation of rates of change.

Methods: This observational cohort study included 434 eyes of 257 participants followed for an average of 4.2 ± 1.1 years and recruited from the Diagnostic Innovations in Glaucoma Study (DIGS). Subjects were followed annually with standard automated perimetry, optic disc stereophotographs and scanning laser polarimetry with enhanced corneal compensation (GDx ECC). Rates of change over time were measured using the visual field index (VFI) and average retinal nerve fiber layer thickness (TSNIT average). A Bayesian hierarchical model was built to integrate information from the longitudinal measures and classify individual eyes as progressing or not. Estimates of sensitivity and specificity of the Bayes method were compared to those obtained by the conventional approach of ordinary least squares (OLS) regression.

Results: The Bayes method identified a significantly higher proportion of the 405 glaucoma and suspect eyes as having progressed compared to the OLS method (22.7% vs. 13%; $p < 0.001$), while having the same specificity of 100% in 29 healthy eyes. In addition, the Bayes method identified as progressing a significantly higher proportion of eyes with progression by optic disc stereophotographs compared to the OLS method (74% vs. 37%; $p = 0.001$).

Conclusion: A Bayesian hierarchical modeling approach for combining functional and structural tests performed significantly better than the conventional OLS method for detection of glaucoma progression and estimation of rates of change over time.

C39 FREE PAPER SESSION

FP13 270° SELECTIVE LASER TRABECULOPLASTY IN PSEUDOEXFOLIATIVE AND PRIMARY OPEN-ANGLE GLAUCOMA: A PROSPECTIVE CLINICAL TRIAL

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Background: The purpose of this study was to compare the pressure lowering potential of the 270° selective laser trabeculoplasty (SLT) in patients with pseudoexfoliation (PXF) and primary open-angle glaucoma (POAG) with minimum follow-up time of 6 months.

Methods: The study was a single-center, prospective, non-randomized, interventional case series. All patients were examined, treated and followed-up by one ophthalmologist. The patients received 270° SLT-treatment of 75 non-overlapping pulses on trabecular meshwork. The patient's medication of glaucoma was not changed within whole time of study. The mean amount of glaucoma medication in PXF-group was 1.63 ± 1.22 and in POAG-group 1.72 ± 1.32 ($p = 0.777$).

Results: Sixty-six eyes of 42 patients were treated, 30 eyes in PXF-group and 36 eyes in POAG-group. The SLT-treatment of 66 eyes showed 20% decrease of mean intraocular pressure (IOP) from 23.71 ± 4.53 mmHg to 19.02 ± 4.46 mmHg ($p = 0.000$). The mean IOP drop in the PXF-group was 19% from 22.03 ± 3.95 to 17.80 ± 3.58 mmHg ($p = 0.000$) and in POAG-group comparably 20% from 25.11 ± 4.55 mmHg to 20.03 ± 4.90 ($p = 0.000$). Outcome was defined successful, when IOP was decreased $\geq 20\%$ (definition 1) or ≥ 3 mmHg (definition 2) from baseline and no further need for laser- or incisional surgery and the number of glaucoma medication was the same or less than preoperative. According to definition 1 the over-all success rate was 50% in PXF-group (15 eyes of 30) and 61% in POAG-group (23 eyes of 36); according to definition 2 the success rates were 80% in PXF-group (24 eyes of 30) and 83% in POAG-group (30 eyes of 36). Postoperative inflammatory reaction, cells and flare, was scanty in both groups. There were no intraoperative complications due to SLT.

Conclusion: 270° SLT procedure seems to be a useful glaucoma treatment in both POAG- and PXF-patients.

FP14 CHANGES OF INTRAOCULAR PRESSURE AFTER INTRAVITREAL INJECTION OF BEVACIZUMAB (AVASTIN)

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Background: Intravitreal bevacizumab injections have become a widespread treatment for neovascular AMD. Several case reports and a recent study of 101 eyes have described intra-ocular pressure (IOP) elevation after repeated injections. We wanted to study a large group of patients treated in our retina clinic and evaluate the incidence and possible risk factors for IOP elevation after repeated intravitreal bevacizumab injections in neovascular age-related macular degeneration (AMD) patients.

Methods: We reviewed the charts of 203 consecutive

patients treated in our retina clinic with intravitreal bevacizumab for AMD. Data collected for each patient included: IOP before the initiation of treatment, before each subsequent injection and at the end of follow up; number of injections; length of follow up and the presence of glaucoma before treatment. Patients with preexisting uncontrolled glaucoma were excluded. Sustained IOP elevation was defined as above 21 mmHg for more than 30 days.

Results: Sustained IOP elevation was observed in 29 of 235 (12%) treated eyes. Twenty-two eyes required medications to control IOP. At the time of diagnosis, average IOP was 25 mmHg (range 22-36). There was no statistical difference in post-injection IOP elevation between patients with or without pre-existing glaucoma. There was no correlation between IOP at the end of follow-up or at the time of IOP elevation and: pre-injection IOP; length of follow-up and number of injections. The only statistically significant difference was the mean interval between injections: 2.45 months in patients without and 1.9 months in patients with sustained IOP elevation.

Conclusion: AMD patients undergoing repeated intravitreal bevacizumab injections, especially when frequent, are at an increased risk of sustained IOP elevation. Regular IOP measurements and IOP-lowering treatment in patients with persistent elevation are recommended.

FP15 THE TRABECTOME. CLINICAL RESULTS AND GLAUCOMA SUBGROUP ANALYSIS

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Background and Purpose: Altered outflow-resistance in the juxtacanalicular trabecular meshwork is responsible for an increased intraocular pressure (IOP) in open-angle glaucomas. The Trabectome is a new, minimal invasive surgical option to selectively remove this trabecular meshwork under gonioscopic control.

Methods: Prospective case study. One hundred twenty eyes of 115 patients with primary or secondary open-angle glaucoma were included. Intra- and postoperative complications were documented, the efficacy of the Trabectome was investigated analyzing postoperative IOPs and the number of topical medications needed to reach sufficient IOP control.

Results: Mean preoperative IOP was 25 ± 6 mmHg under mean 2.1 medications. Intra-operatively, trabecular meshwork was removed for 90-120° using the Trabectome. Almost all patients showed mild intraoperative reflux-bleeding from the collector channels in the posterior wall of Schlemm's canal. On postoperative day one, mean IOP dropped to 13 ± 6 mmHg. After a mean follow-up of 313 days, IOP decreased to a mean of 17 ± 2 mmHg. Mean number of medications was reduced to $n = 1.5$. Subgroup analysis revealed best pressure lowering effect for PEX, Pigmentary glaucoma and Steroid-induced glaucoma (mean -37%), most efficient reduction of topical medications was seen in normal-tension glaucoma patients (-58%). No serious intra- or post-operative complications were observed.

Conclusion: The Trabectome is a promising new option in non-filtering glaucoma surgery. Access to the anterior chamber is minimally invasive via a 1.7 mm clear-cornea tunnel, the conjunctiva is not altered. Indication for surgery needs to be assessed individually. A larger number of patients and

longer follow-up data are necessary to further elucidate the value of this new method in glaucoma angle surgery.

FP16 THE CONTRIBUTION OF RETINAL VASCULATURE TO SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY RETINAL NERVE FIBER LAYER SCANS IN NORMAL AND GLAUCOMA EYES

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Background: Measurement of the parapapillary retinal nerve fiber layer (RNFL) provides important information for evaluating the optic nerve in glaucomatous neuropathy. Spectral Domain Optical Coherence Tomography (SD-OCT) is one of several non-invasive scanning technologies often used to assess the RNFL *in vivo*. Assessment of the RNFL thickness is based on B-scans acquired using a 12 degree circular scan path centered on the optic nerve. Current analysis includes TSNIT plots along with average global and sectorial data that are compared to a normative database. However, an accurate analysis of the RNFL requires consideration of ocular biometry, scan path distance from the rim margin and accounting for non-neuronal tissue. The purpose of this study was to investigate the contribution of retinal vasculature to RNFL measures in both normal and glaucomatous eyes using custom scans in non-human primates.

Methods: Cross-sectional data from 47 normal rhesus monkeys along with longitudinal data from 5 animals with unilateral experimental glaucoma were used for data analysis. Raster and radial scans centered on the optic nerve were acquired using the Spectralis HRA+OCT (Heidelberg Engineering, Heidelberg, Germany). The raw image files were exported for analysis using custom MATLAB (The Mathworks, Inc., Natwick, MA) programs. Prior to analysis, images for each animal were rescaled to 1:1 μm based on transverse scaling computed using ocular biometry measures (IOL Master, Carl Zeiss Meditec Inc., Dublin, CA) and a three surface schematic eye. The neural canal opening (NCO) was identified using the radial scans, and custom B-scans 550 μm from the NCO were interpolated from the raster scans. Retinal vessels were identified by the underlying shadows, and subtracted from the global RNFL measures.

Results: In non-glaucomatous eyes, the average RNFL thickness, after vessel compensation, for scans 550 μm from the NCO measured $111.9 \pm 9.1 \mu\text{m}$. Retinal vasculature accounted for $9.4 \pm 1.3 \%$ of the global RNFL thickness ($123 \pm 9.3 \mu\text{m}$). For animals followed longitudinally, the percentage vascular contribution to the RNFL increased with decreasing RNFL thickness ($R^2 = 0.58$, $p < 0.01$). However, the overall vessel thickness contribution to the RNFL decreased with increasing disease severity ($R^2 = 0.21$, $p < 0.01$). There was no significant relationship between RNFL thickness and vessel thickness contribution in the non-glaucomatous eyes ($R^2 = 0.02$, $p = 0.18$).

Conclusions: The retinal vasculature within the RNFL accounts for a large proportion of the RNFL thickness measures in both normal and glaucomatous eyes. With disease progression, although the proportion of retinal vasculature increases, the overall thickness contribution decreases. The decrease in vessel thickness contribution reflects: 1) vessels falling outside the RNFL segmentation; and 2) a decrease in vessel caliber with disease progression.

Support: NIH/NEI grants: R01 EY001139, P30 EY007551

FP17 THE INTRAOCULAR PRESSURE-REDUCING EFFECT OF ORAL PARACETAMOL – A PILOT STUDY

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Background: Several studies have confirmed the ability of cannabinoids to reduce intraocular pressure (IOP). Experimental data recently unequivocally demonstrated that the analgesic effect of paracetamol is due to its indirect action on cannabinoid CB₁ receptors. The question then arises as to whether paracetamol can reduce IOP via its effect on intraocular cannabinoid receptors.

Methods: A two-week, prospective, randomized, controlled, single center, parallel group pilot study was carried out to determine the efficacy and safety of orally administered paracetamol 1g every 6 hours in adult patients with primary or secondary open-angle glaucoma as compared to topical levobunolol 0.5% twice a day. Patient well-being was closely monitored throughout the study and focused on hepatic safety in accordance with the Drug Induced Liver Injury (DILI) Network Criteria.

Results: Eighteen adult patients were enrolled in the study, nine in the topical levobunolol group and nine in the oral paracetamol group. In the levobunolol group the mean IOP reduction at day 7 was 7.5 mmHg ($p < 0.008$) and at day 14 was 9.1 mmHg ($p < 0.005$) from a mean IOP baseline of 29.6 mmHg. The corresponding figures for the paracetamol group were 8.8 mmHg ($p < 0.0004$) at day 7 and 6.5 mmHg ($p < 0.004$) at day 14 from a mean IOP baseline of 29.4 mmHg. A mean IOP reduction of 20% or more from baseline was achieved in 78% of patients in the levobunolol group compared with 63% of patients in the paracetamol group at week 2 of the study. Both study regimens were well tolerated. No serious treatment-related adverse events were reported in either of the two treatment groups. Liver function tests, systolic/diastolic blood pressures and heart rates remained unchanged during the two weeks of the study in both groups.

Conclusion: The results of this study suggest that paracetamol taken orally, 1 g every 6 hours, reduces IOP in patients with open-angle glaucoma and/or angle recession glaucoma in a comparable way to a topical beta-adrenergic receptor antagonist.

FP18 TEMPORAL RELATIONSHIPS OF CLINICAL SIGNS OF GLAUCOMATOUS NEUROPATHY

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Background: The clinical signs of glaucomatous neuropathy include 1) losses in visual sensitivity (localized or diffuse), 2) increased cupping of the optic nerve head (ONH) with a thinning of the neuroretinal rim, and 3) localized or diffuse loss in circumpapillary retinal nerve fiber layer (RNFL) thickness. However, the clinical signs do not occur simultaneously and it is important to define the temporal relationships for these features of the pathology of glaucoma.

Methods: Rhesus monkeys with unilateral experimental glaucoma were followed by subjective and objective measurements over the course of induced optic neuropathy. Visual fields were obtained by behavioral methods using standard automated perimetry (SAP). Spectral domain optical coherence tomography (SD OCT) using the Spectralis

HRA+OCT (Heidelberg Engineering), was used for scanning the optic nerve head (ONH) and the circumpapillary retinal nerve fiber layer (RNFL). The SD OCT raw image files were exported for analysis using custom MATLAB programs to 1) rescale the images to a 1:1 aspect ratio using transverse scaling based on each animal's ocular biometry, 2) acquire circumpapillary RNFL thickness and area data from interpolated raster scans after removal of blood vessels, and 3) derive ONH cup volume parameters from contour maps interpolated from radial scans centered on the ONH and referenced to the surface of the retina or to the level of the neural canal opening (NCO). In order to present the data from these different measurements on a common scale, the data were converted to Z-scores based on standard deviation (SD) units derived from repeated measures of each animal's control eye.

Results: Preliminary data have been collected for two monkeys, each followed for about 8 months after their intraocular pressures (IOP) were elevated. For both subjects, clinically significant ($p < .05$) ONH cupping and global thinning of the RNFL had occurred within 1 month of IOP elevation, while

significant mean deviation (MD) loss of visual sensitivity did not occur until 4-6 months. The significance of ONH cupping and RNFL thinning progressed rapidly, with differences exceeding 10 SD units within 2-4 months, while the visual field losses did not exceed 4 SD units at the end of 8 months of experimental glaucoma. The different temporal relationships for the clinical signs of glaucomatous neuropathy are partially explained by differences in the precision of objective and subjective measurements. The coefficients of variation (CV) for the repeated measurements of the control eye were much smaller for the objective measurements (1-2% for RNFL thickness, 2-8% for cup volume below the NCO) compared to a CV of 22-30% for SAP measurements.

Conclusions: Quantitative assessments of the clinical signs of glaucoma that are caused by biomechanical stresses and neuronal losses demonstrated different time-courses of progression which, in part, reflects differences in precision of subjective and objective measures. Further analyses are required to determine whether there are also neuronal components underlying the different temporal relationships.

Support: NIH/NEI grants: R01 EY01139 & P30 EY07551

GLAUCOMA SOCIETY SYMPOSIUM ABSTRACTS

GS1 THE MIDDLE EAST, EGYPTIAN AND AFRICAN DISPARITIES AND CHALLENGES

Chairs: Ahmed Abo-el Enein (Egypt), Fathi El Sayyad (Egypt), Amal Ouertani (Tunisia)

Description: The symposium will discuss the status of glaucoma diagnosis and management in the Middle East African region with special focus on Egypt. The speakers will report on available epidemiological data and emphasize on some anatomical and functional changes in glaucoma. The unique challenges present will be discussed within the region including lack of adequate infrastructure, skilled personnel and affordability and availability of anti glaucoma drugs trying to bring some answers to how to improve the situation. The symposium will feature common types of glaucoma in the region including pseudo-exfoliation, traumatic, glaucoma secondary to retinal surgery as well as OCT and Ocular blood flow to detect glaucoma progression.

GS2 OCULAR BLOOD FLOW IN YOUNG PATIENTS WITH OPTIC DISC SUSPICIOUS OF GLAUCOMA

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Introduction: Normal-tension glaucoma (NTG) refers to glaucomatous optic nerve head changes and corresponding glaucomatous visual field defects in the absence of elevated IOP. An elevated prevalence of vasospastic diseases (primarily migraine and Raynaud's disease), ischemic vascular diseases, and hypotension are common.

Purpose: To evaluate the retro-ocular blood flow in the young age patients with suspicious glaucomatous optic nerve head.

Patients and Methods: Twenty two young patients with mean age 20years 10 of them with normal optic discs as control and 12 with bilateral variable degrees of optic nerve head glaucoma like changes were enrolled in the study. All patients underwent complete ophthalmic examination & diurnal measurement of IOP, Visual field assessment & OCT (5 of them) and retro-ocular Doppler have been done.

Results: Compared to the control group, no significant difference has been observed in the PSV, EDV and RI of the retro-ocular ophthalmic and central retinal arteries between the two groups.

Conclusion: Young patients have to be followed up closely before considering them low tension glaucoma

GS3 GLAUCOMA – A DIAGNOSIS BASED ON PROBABILITY

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This review discusses the process of making the medical decision for the diagnosis of glaucoma and the determination of therapeutic behavior. We discuss the complex evaluation of the signs of glaucoma – the often vague boundary between norm and pathology in function and structure. We conclude

that when building diagnosis, we rely on the likelihood of a structural or functional finding to be the norm or pathology, and diagnosis is often based on the judgment of what is the probability of a patient to develop glaucoma defects after certain time. The same goes for therapy – the art is deciding which treatment regimen most likely to stop or slow the glaucoma progression so that the patient can preserve visual functions.

GS4 OCT EVALUATION OF OPTIC NERVE HEAD IN PATIENTS SUSPECT FOR GLAUCOMA

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Aim of the study: Searching for new criteria in interpretation of Optic nerve head (ONH) in patients suspect for glaucoma.

Methods: The study was done on 30 patients which were randomly chosen. The focus was on suspect patients with ocular hypertension. The OCT machine that was used is Optovue RTvue-100. The interpretation of optic nerve parameters seems to be very important factor in determining the diagnose for glaucomatous process. Despite the well-known RNFL thickness-based protocols and GCC-mapping protocols, we feel that there is a need for additional criteria describing morphological changes in the ONH, to provide more complete clinical picture and way to exact diagnose. The algorithm for determining the ONH parameters The algorithm is based on the 'floating canvas' principle. In normal eyes it performs quite well and exact. But there is a problem in determining the borders and size of the ONH and the excavation in myopic disk, tilted disk, hypermetropic disk. The algorithm searches for the pigment epithelium as a most hyperreflective tissue to determine the boundary of the ONH, but in eyes with parapapillary atrophy the pigment epithelium is way off from the real border of the ONH.

Results: We propose the Bruch membrane to be used as a anchor point from which the border should be estimated and we call it 'nerve canal opening' (NCO), position of lamina cribrosa according to NCO, thickness of lamina cribrosa and shape of the optic nerve below the lamina cribrosa. We believe that this additional signs will be very helpful for early detection of Glaucomatous process.

GS5 CENTRAL CORNEAL THICKNESS IN PATIENTS WITH ADVANCED PRIMARY OPEN-ANGLE GLAUCOMA

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Background: To examine central corneal thickness (CCT) in patients with uncontrolled advanced primary open-angle glaucoma (POAG) and to perform comparative study in relation to CCT in healthy persons of the same age group. To make a comparative study of glaucoma changes in patients with advanced POAG, divided in 3 groups according to the corneal thickness.

Methods: CCT was measured in 40 patients (64 eyes) with advanced POAG – cup/disc ratio = 0.76 ± 0.09 ; intraocular pressure (IOP) = 21.01 ± 3.6 mmHg; MD = -20.1 ± 7.8 dB;

PSD = 8.4 ± 2.9 dB. The results were compared to those of the same examinations in 30 healthy persons (60 eyes) of the same age group. The group of patients with advanced POAG was divided in 3 groups according to CCT. The rest of the routine diagnostic methods, used in the ophthalmology practice: establishing visual acuity, tonometry, gonioscopy, ophthalmoscopy, computer perimetry, were done also in all patients.

Results: Statistically significant difference between healthy eyes and these with advanced POAG in relation to C/D, IOP, MD, PSD and CCT was found. The cornea was statistically thinner in patients with advanced POAG. When patients with advanced POAG were divided into groups according to corneal thickness, it was found that the worse glaucoma defects were available in the group of patients with thinner corneas.

Conclusion: A statistically thinner CCT in patients with advanced POAG was found. There was correlation in changes of CCT and MD. Therefore, the necessity of assessment and eventual rectification of tonometric values according to CCT data during examination and treatment of patients with POAG was accentuated. Presumably, the compensation of IOP in the group with thinner cornea was insufficient or incorrectly interpreted.

GS6 COMBINED SURGERY IN ADVANCED PRIMARY CONGENITAL GLAUCOMA

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Background: Combined surgery trabeculotomy (TT) and trabeculectomy (TE) is often the method of choice in advanced primary congenital glaucoma (PCG).

Purpose: To compare the efficacy and complications of TT and TE with Mitomycin C (MMC) performed in two steps or combined in one step in advanced PCG.

Methods: Thirty-five eyes of 24 children with advanced PCG underwent TT and TE with MMC. The eyes were divided in two groups: group 1 – surgery was performed in two steps: TT and after 1-2 months: TE, because of inadequate efficacy (20 eyes); and group 2: TT and TE with MMC performed in one step (15 eyes). IOP before surgery was 28 ± 5 mmHg in group 1 and 30 ± 6 mmHg in group 2. IOP before and after surgery, corneal size, efficacy and complications were compared between the two groups. Follow-up period was up to 10 years.

Results: Postoperative IOP one month after surgery was 15 ± 4 mmHg in group 1 and 14 ± 4 mmHg in group 2. In the follow-up period 30% in group 1 and 33% in group 2 needed additional medical or surgical treatment. Most common complications in the early postoperative period prevailing in group 2 were hypotony, shallow anterior chamber, hyphema, cataract (rarely – 1 eye in group 2) and in the late post-surgical period – elevation of IOP.

Conclusions: In advanced PCG combined one-step anti-glaucoma surgery (TT+TE with MMC) is with a good efficacy similar to that of two-step anti-glaucoma surgery, but with more complications in the early post-surgical period.

GS7 EFFICACY OF TRABECULECTOMY WITH MITOMYCIN C IN PSEUDOEXFOLIATIVE GLAUCOMA PATIENTS AFTER A MINIMUM OF TWO YEARS FOLLOW-UP

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Purpose: To assess the absolute and qualified success of trabeculectomy (TE) with mitomycin C (MMC) in pseudoexfoliative glaucoma patients followed-up more than two years.

Methods: Forty pseudoexfoliative glaucoma patients undergoing TE with MMC and with a minimum of two-year follow-up are included. We measure the success of TE as absolute success if the intraocular pressure (IOP) is ≤ 18 mmHg and ≥ 6 mmHg without the use of glaucoma medications and as qualified success if the IOP is ≤ 18 mmHg under glaucoma medications.

Results: The mean preoperative IOP was 31.1 ± 9.3 mmHg (range 21-57). In mean period of 2.8 ± 1.2 years (range 2-5) after surgery we observe the statistically significant decrease of IOP (mean IOP 14.8 ± 5.4 mmHg, $p < 0.001$). After more than two years 34 eyes are with IOP < 18 mmHg. An absolute success of operation is observed in 21 (52.5%) patients and a qualified success – in 13 (32.5%) patients. Elevated IOP under glaucoma medications with mean value 24.2 ± 4.6 mmHg, range 19-32 mmHg (unsuccessful TE) is found in 6 (15%) of the patients.

Conclusions: Our results show a successful TE (with absolute and qualified success) in 85% of pseudoexfoliative glaucoma patients after more than two years follow-up.

GS8 EXPRESS IMPLANT: TECHNIQUE AND FIRST RESULTS

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Using ExPress implant in glaucoma treatment changed the standard filtering glaucoma surgery. The implant allows a control over the subsclear outflow and avoids the postoperative hypotony. The successful outcome of the operation demands knowledge of the technique of insertion consisting of several important steps: Scleral or subsclear application of Mytomicin – Formation of adequate sclera flab – Correctly directed puncture of the anterior chamber – Implant insertion maintaining the anterior chamber deep enough, using visco substances or maintainer. Our first results concerning the postoperative IOP are very good without any complications.

GS9 FIRST RESULTS WITH EX-PRESS IMPLANT IN PATIENTS WITH GLAUCOMA

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Aims: First results in use of a Ex-press glaucoma filtration device.

Methods: The device was implanted in 15 patients with POAG. Two of them were done in combined fashion with phaco. One patient was implanted in both eyes with one month interval between the two operations.

Results: In the early post-op period there was no significant swelling of the anterior chamber, hyphema, edema cornea and inflammation. In the first post op day the mean IOP was 10 mm and on the first and third month the mean IOP was 15.5 mm. There was no significant endothelial cell loss or it was no more than 5% between pre and post-op. We have one patient with macular edema due to cyclodialysis and hypotony (5 mmHg) which resolved after one month.

Conclusion: The Ex-press device is safer and more predictable, and gives satisfactory results which are in some terms

superior compared to TE. The combined procedures are less complicated compared to the standard phacotrabeculectomy due to the controlled outflow provided from the Ex-press glaucoma filtration device.

GS10 SUCCESSFUL CONTROL OF INTRAOCULAR PRESSURE IN SECONDARY GLAUCOMA WITH IMPLANTS

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Background: To present the results of treatment in patients with secondary glaucoma.

Methods: A retrospective study of 24 consecutive patients with secondary non-compensated glaucoma for a period of one year (January 2009- January 2010) was done. Full eye examination, gonioscopy, B-scan, visual field testing and OCT were performed in all patients. The demographic data and the etiology of the secondary glaucoma were analyzed. Treatment was conservative and surgical in all cases.

Results: The average age of patients was 42 years (range 24 to 76). The most common cause of secondary glaucoma was anterior synechiae as a result of pseudophakic keratopathy in 8 patients (33%). Other causes included: exfoliative glaucoma – in 5 (21%), pigmented glaucoma – in 4 (17%), post-traumatic aphakia – in 3 (13%), anterior chamber trauma – in 2 (8%), and herpetic keratouveitis – in 2 (8%). The surgical treatment included filtration surgeries: trabeculectomy with Ologen® – in 19 patients (79%), filtering procedure with Ex-Press® – in 3 (13%) and filtering procedure with the Ahmed® valve – in 1 (4%). Avastin® of dose of 2.5 mg/0.1 ml was injected in the anterior chamber of 1 patient (4%) with neovascular glaucoma and IOP decreased from 45,0 mmHg to 28,0 mmHg in this case. In patients treated with TE and Ologen®, IOP was reduced from 38,0 mmHg to 17,3 mmHg on average; in patients with the Ex-Press® drainage device – from 45,0 mmHg to 12,0 mmHg; and in the patient with the

Ahmed® valve – from 50,0 mmHg to 17,3 mmHg. The follow-up period was from 12 to 24 months.

Conclusion: A customized approach is necessary in all cases with secondary glaucoma depending on the etiology, disease's progression, condition of the other eye, and IOP values. Surgery is indicated in most of the patients with secondary glaucoma.

GS11 OCT IN THE DIAGNOSIS AND FOLLOW-UP OF GLAUCOMAS

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Background: The irreversible loss of ganglion cells, which is in the basis of glaucoma, leads to attenuation and damage of the retinal nerve fiber layer (RNFL). It is known that 40% of the axons had to be lost for the detection of any changes in visual function (visual field). Structural alterations in the RNFL, detected by OCT, precede those in the optic nerve head and visual field. The purpose of this presentation is to share our experience in using OCT for early diagnosis and follow up of glaucoma patients.

Methods: For the period from June 2009 to December 2010, 285 patients with glaucoma or suspected glaucoma were examined with the Stratus OCT™. The central corneal thickness, chamber angle, peripapillary RNFL, optic nerve head and macular region were scanned and measured.

Results: OCT is a suitable diagnostic method for: identifying the integrity of the RNFL in glaucoma suspects with a large excavation, setting up a suspicion for glaucoma before any detectable changes in the visual field, follow up of patients with ocular hypertension, and follow up of glaucoma patients for progressive loss of RNFL.

Conclusions: OCT is helpful in the diagnosis and follow-up of patients with glaucoma. The interpretation of the results is always in conjunction with clinical data, visual-field changes and IOP measurements.

GRAND ROUNDS

GR1 CONCURRENT POSNER SCHLOSSMAN SYNDROME AND CMV RETINITIS DURING IMMUNOTHERAPY FOR COMMON VARIABLE IMMUNODEFICIENCY

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A 44-year-old male with a common variable immunodeficiency (CVID) and a history of five recurrent episodic iritis with raised intraocular pressure (IOP) resembling Posner Schlossman syndrome (PSS) in each eye (twice in both eyes simultaneously) has been followed for 2 years in our clinic. CVID is a primary immunodeficiency disease characterized by hypogammaglobulinaemia, recurrent bacterial infections and impaired antibody responses. T-cell abnormalities are associated in about half of all CVID patients. A presumptive diagnosis of PSS was made based on the following findings: recurrent episodes of mild iritis, associated with elevated IOPs, diffuse epithelial edema of the cornea and a few fine keratic precipitates (KPs). In all episodes, treatment only consisted of topical steroids and glaucoma medications (topical and oral). By the end of every episode his visual acuity (VA) was around 1 in both eyes. The last episode took place in the left eye (anterior segment pictures are provided) and was treated with topical dexametasone four times a day, topical fixed combination of brimonidine tartrate and timolol maleate, and topical brinzolamide twice a day. In addition, the patient was being treated with intravenous γ -globulin therapy and oral steroids due to ulcerative colitis. A week later, VA in this eye dropped to 0.3. Fundus examination showed perivascular fluffy white lesion 360°, few scattered hemorrhages and a white granular appearing lesion (retinal necrosis) in the inferior nasal periphery (pictures are provided). Despite therapy with intravenous acyclovir was started immediately, any improvement was seen 10 days later. Hence, anterior chamber tap was performed and the aqueous sample was analyzed by polymerase chain reaction (PCR). Shortly later, an intravitreal injection of foscarnet (2.4 mg/0.1 mL) was used. A week later, there was a great improvement in fundus lesion. Aqueous was positive for CMV DNA by PCR. Afterwards, orally valganciclovir (900 mg once daily) was administered for 3 weeks. At the last visit: VA was 0.7 and IOP was 16 mmHg (still treated with topical fixed combination of brimonidine tartrate and timolol maleate).

Discussion: Ocular CMV infection can manifest in a number of ways, ranging in severity from an episodic anterior uveitis resembling PSS, to a chronic anterior uveitis similar to Fuchs heterochromic iridocyclitis, and ultimately to retinitis. These manifestations would be dependent on the ocular immune response and/or the viral load, with the anterior segment entities being the main mode of expression of infection in a relatively competent immune system and retinitis occurring in immunocompromised eyes. The signs seen in eyes with presumed PSS are probably the result of an inflammatory response to the CMV infection as they often respond to topical steroids alone and may even be self-limiting. Sometimes, glaucoma medications are required to get sooner and better IOP control. However, this repeated use of steroids may be permissive to viral replication, leading to increasing-

ly frequent attacks and attendant glaucomatous damage. In this case, CMV retinitis would be due to an impaired T-cell function caused not only by CVID itself, but also by immunosuppressive therapy.

GR2 GRAND ROUND: PUZZLING ASYMMETRY

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Objective: To explore the role of corneal biomechanics in a case of asymmetric glaucoma in a young patient.

Presenting complaints: A 36-year-old male presented with a history of loss of vision – left eye for 5 months.

History of presenting illness: Insidious onset, gradually progressive, painless loss of vision left eye for past 5 months accompanied by headache. History of oral prednisolone use for 2 years for allergic skin disease.

Treatment history: Diagnosed glaucoma elsewhere and was started on G. Travoprost 0.004% (OU) HS about 4 months back.

Posterior segment right eye:

Optic disc – cup-disc ratio of 0.3 and a healthy looking neuroretinal rim.

Posterior segment left eye:

Cup-disc ratio of 0.9, a deep cup and diffuse thinning of the neuroretinal rim.

Probable diagnosis: 1. Steroid-induced rise in IOP (OU), with advanced glaucomatous optic neuropathy (OS); or 2. Juvenile open-angle glaucoma worsened by use of oral steroids.

Ocular response analyzer: Analysis carried out to determine factors for markedly asymmetric damage. Corneal hysteresis (mmHg): 8.2 (OD), 4.6 (OS) IOP_{cc} (mmHg): 25.3 (OD), 56.1 (OS).

Management:

Oral acetazolamide, topical timolol, brimonidine and dorzolamide (OU)

Follow-up IOP at 1 month (mmHg): 12 (OD), 58 (OS)

Diode laser cyclophotocoagulation (DLCP) – OS carried out IOP 6 months post DLCP (mmHg): 16 (OD), 42 (OS) (on topical medication).

Discussion: Markedly asymmetric in optic nerve damage in two eyes despite equal exposure to systemic steroids. Good response to medication in right eye, left eye refractory to medication and DLCP. Asymmetry in the corneal hysteresis may offer an explanation; differences in corneal biomechanics could reflect structural differences between eyes at the level of lamina cribrosa.¹ Low corneal hysteresis found to be predictive of visual field progression,² associated with worse eyes independently of its effect on IOP measurement in asymmetric primary open angle glaucoma.³ Measurement of corneal hysteresis may be a useful adjunct in evaluating cases of asymmetric glaucoma.

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GR3 SEVERE AND REFRACTORY OCULAR HYPERTENSION AFTER IOL AND INTRAVITREAL INJECTION OF TRIAMCINOLONE

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Ms C is an 80-year-old diabetic patient who had left phacemulsification with implantation of an anterior chamber intraocular lens (ACIOL) because of intraoperative rupture of the posterior capsule. During the early postoperative period, she developed anterior uveitis and cystoid macular edema (CME) which were not responsive to topical steroid and intravitreal injection of triamcinolone and bevacizumab. Nevertheless, the intraocular pressure (IOP) was controlled at 16 mmHg with topical carbonic anhydrase inhibitor and beta-blocker. In view of the long-standing (4 months after the surgery) anterior uveitis, CME and low endothelial cell count (CD of 1,245), it was decided to have the ACIOL removed. A sclera-fixated IOL was implanted and triamcinolone (2 mg) and Ranibizumab (2.3 mg) were injected intravitreally at the end of the operation. The surgery was uneventful. Three days after the procedure, however, the IOP increased to 45 mmHg. There were significant corneal epithelial edema and persistent anterior uveitis. Despite maximally tolerated medical therapy including multiple topical IOP lowering medications and intravenous mannitol, the IOP remained elevated at a level between 40 and 56 mmHg. Since she refused further surgical treatments such as G-probe or trabeculectomy, we could only lower the IOP to normal level by anterior chamber paracentesis (ACP) which was performed whenever IOP was > 40 mmHg. ACP was performed 2 to 3 times a day and over 10 ACPs were performed for her. The patient finally agreed for surgery on post-op D12. She received a fornix-based trabeculectomy with sclerotomy performed through the scleral tunnel fashioned at the time of IOL exchange. After the operation, the IOP got back to normal level without any glaucoma medication and the anterior uveitis was resolved.

Issues for discussion:

1. Etiology of severe and refractory IOP elevation: was it mainly due to intravitreal injection of triamcinolone (this was the second time; mind ocular hypertensive effect for the first time).
2. Management options for severe and refractory IOP elevation in the early post-operative period. We were forced to perform multiple ACP to control the IOP, any other alternative?
3. Surgical challenges of filtration surgery in an eye with recent prior conjunctival dissection and persistent anterior uveitis.

4. Role of trabeculectomy in the treatment of uveitis (studies have shown good effect in reducing the degree of uveitis).

GR4 NORMAL-TENSION GLAUCOMA IN A YOUNG ADULT PATIENT OR WHAT?

N. Kasahara

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A 40-year-old white female was referred for a second opinion on glaucoma; her past medical history was remarkable for asthma and migraine. On examination, visual acuity was 20/20 OU; biomicroscopy revealed clear corneas, deep and quiet anterior chamber and clear lens OU; applanation tonometry were 15 mmHg OD and 16 mmHg OS and corneal thickness were 529 u OD and 532 u OS. On fundus examination, OD revealed a 0.7 C/D OD and 0.8 C/D OS with superior notching OU. Automated perimetry showed an inferior nasal step OD and an inferior arcuate scotoma OS.

GR5 PROGRESSION OF GLAUCOMA IN A PATIENT WITH BOSTON KERATOPROSTHESIS

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LV Prasad Eye Institute, Hyderabad – India

A 14- year-old male, with history of firecracker injury in September 2003. He had Amniotic membrane grafting twice and later was sent for further management to our institute. At the time of presentation he was having periorbital scar, punctal stenosis, ankyloblepharon, symblepharon with shallow fornices and vascularized cornea in both eyes. Ultrasound B scan done was within normal limits in both eyes. We made a diagnosis of thermal injury S/P Amniotic membrane grafting twice in both eyes. He underwent symblepharon release with amniotic membrane grafting in right eye followed by a living related limbal transplant in February 2004 and May 2004 respectively in right eye. Later he underwent penetrating keratoplasty with extracapsular cataract extraction with posterior chamber intraocular lens implantation in the right eye with reasonable visual gain. Later he had to undergo repeat corneal grafting in 2006 June because of graft failure. And again in 2008 October he underwent repeat penetrating keratoplasty with cultivated oral mucosal transplant with tarsorrhaphy for recurrence of graft failure. The graft again failed, we went ahead with Boston K pro implantation with ocular surface reconstruction with tarsorrhaphy under general anaesthesia on 27th of June 2009. The patient had an immediate post operative vision of 20/60p improving to 20/50p after refraction. His IOP and visual field tests were normal until 3 months. The patient followed up locally with a corneal surgeon. When he was seen after 9 months. He had vision of 20/50, his IOP was high. He presented with advanced disc and field damage. He was planned for an AGV implant on 23rd June 2010. Post surgery he is enjoying a vision of 20/60. His IOP and visual fields are stable. His left eye eventually progressed to phthisis.

VIDEO SESSIONS

VS1 TRABECULECTOMY REVISITED

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Glaucoma Center, Raghudeep Eye Clinic, Ahmedabad, India

Despite emergence of various contenders, trabeculectomy still remains the gold standard for surgical management of glaucoma. However, because of the complications associated with the surgery, even today it is considered the holy grail for the glaucoma surgeon. A well-performed trabeculectomy goes a long way in ensuring long-term success as well as preventing complications. With modifications in the surgical technique, outcomes can be enhanced. This film revisits trabeculectomy and its finer nuances that would help achieve satisfactory outcomes consistently.

VS2 IS TRABECULECTOMY POSSIBLE WITHOUT ANTIMETABOLITES?

M. Ariga, R. Murali
Swamy Eye Clinic, Chennai, India

Trabeculectomy is the surgical procedure of choice for most glaucomas needing surgery. Antimetabolites, although increasing the success rate also induces dreaded complications like infection and hypotony. This film shows how the use of collagen implants can be done safely in routine trabeculectomy, juvenile glaucomas, high myopes and in those requiring combined cataract and glaucoma surgery. The video shows the procedure of collagen implantation (Ologen) in these procedures, explaining the pros and cons of commercially available collagen implants.

VS3 THE 'PEARL NECKLACE' SUTURE. NEVER LOSE A ANTIMETABOLITE-SOAKED SPONGE DURING TRABECULECTOMY AGAIN

D. Lindfield, M.F.P. Griffiths
Frimley Park Hospital, UK

Retained surgical sponges post operative are rare, yet still have their own descriptive terminology (Gossypiboma). There are three case reports of retained material causing granulomatous bleb reactions/blebitis thereby increasing the risk of bleb-related endophthalmitis. We illustrate how PVA pledgets can be strung onto a 5/0 black silk suture. The resultant 'necklace' facilitates unhindered insertion of antimetabolite-soaked sponges during trabeculectomy yet allows all sponges to be removed efficiently by just withdrawing the necklace suture. Never lose a pledget again.

VS4 THE 'CONSTRUCTOR KNOT' FOR DRAINAGE SURGERY

D. Lindfield, M.F.P. Griffiths
Frimley Park Hospital, UK

Glaucoma drainage devices, whether valved or unvalved often require tube ligation or stenting to prevent early hypotony. We illustrate a new technique which allows fine tuning of the knot tension whilst at the same time not 'pinching' or per-

manently damaging the tube. The constrictor knot can be left as a loop so can be pre-placed and loosened or moved and offers significant advantages over conventional techniques.

VS5 MANAGEMENT OF LATE BLEB COMPLICATIONS AFTER TRABECULECTOMY

T. Dada, S. Bhartiya
Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi

This video film will demonstrate the management of bleb related complications arising six months or more after Mitomycin C augmented trabeculectomy. The techniques demonstrated will include: Conjunctival flap for corneal dellen post trabeculectomy; Overhanging bleb repair; Excision of fibrotic bleb overlying the cornea; Management of bleb leak with lamellar scleral flap; Management of hypotony maculopathy with eye bank scleral patch; Tectonic graft for ciliary staphyloma induced by Mitomycin C.

VS6 MANAGEMENT OF FAILING FILTERING BLEBS

G. Chandrasekhar, S. Senthil
Glaucoma Care Services, L.V. Prasad Eye Institute, Hyderabad

The success rate of trabeculectomy decreases with time due to scarring and fibrosis of sub-conjunctival tissue in the post operative period. The surgeon can prevent a bleb from failing starting with preoperative preparation, precautions taken during surgery, modifications during surgical procedure. Post operatively, early identification and appropriate interventions can salvage most of the blebs and increase the survival and success rates of trabeculectomy.

In this video, we shall discuss the presentation and management of failing filtering blebs.

VS7 SURGICAL MANAGEMENT OF ENCAPSULATED BLEB AND HISTOPATHOLOGY

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¹The Eye Pavilion, Vista Healthcare, Dubai, U.A.E.;

²Welcare Hospital, Dubai, U.A.E.

Encapsulated bleb occurs in a small percentage of eyes undergoing filtering surgery whereby a fluid filled cavity lined internally by fibrous tissue leads to surgical failure and markedly elevated intraocular pressure. Most encapsulated blebs resolve with conservative medical management. Needling of the bleb has been reported to have variable rates of success. The purpose of this video is to highlight the surgical technique of external bleb revision in management of an encapsulated bleb of a young male in his forties who was averse to needling of the bleb. On follow up at ten months, the intraocular pressure was well controlled on no medications. Histopathology of the excised bleb is discussed.

VS8 MANAGEMENT OF LEAKING BLEB

G. Chandrasekhar, S. Senthil
Glaucoma Care Services, L.V. Prasad Eye Institute, Hyderabad, India

Early postoperative bleb leaks occur due to surgical technique or trauma. Postoperative bleb leak has risk of vision threatening complications like endophthalmitis and hypotensive maculopathy. Late leaking blebs are becoming increasingly common with the widespread use of antimetabolites in glaucoma filtering surgery. In this video we demonstrate different surgical techniques employed in the management of post operative bleb leak including conjunctival autograft with sutures, conjunctival autograft with fibrin glue, bleb repair with amniotic membrane grafting and conjunctival advancement technique.

VS9 REPAIR OF LATE BLEB LEAK WITH LAMELLAR SCLERAL FLAP

R. Gupta, T. Dada

Prasad Centre for Ophthalmic Sciences (R.P.C.), ALL India Institute of Medical Sciences (A.I.I.M.S.), India

This video will depict the management of a case with recurrent blebitis with bleb leak post MMC augmented trabeculectomy. After localized peritomy over the bleb, the area of leak was identified and a lamellar scleral flap raised from behind the area of leakage, reflected over and sutured on to the area of leakage. This technique is useful for management of late bleb leak associated with scleral necrosis when eye bank sclera is not available.

VS10 SUPRACHOROIDAL EFFUSIONS AND HEMORRHAGE AFTER TRABECULECTOMY: RECOGNITION AND MANAGEMENT

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Suprachoroidal effusion and hemorrhage, although uncommon, are feared complications after trabeculectomy. They occur in the setting of sudden reduction of Intraocular pressure from high levels in chronic glaucomatous eyes. They could have a detrimental effect on eventual visual outcomes, and final intraocular pressure control. Early identification, and appropriate management will help in optimizing outcomes. A series of three cases of suprachoroidal hemorrhage, and effusion after trabeculectomy, will be presented along with subsequent management along with technique of choroidal drainage.

VS11 3D EVALUATION OF THE LAMINA CRIBROSA USING ENHANCED DEPTH IMAGING SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY IN GLAUCOMA

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Spectral domain optical coherence tomography (SD-OCT) imaging of the human optic nerve head has been proved

useful in assessing the lamina cribrosa. However, the use of SD-OCT had a limitation that posterior part of the lamina cribrosa was often indiscernible. In this video we describe the enhanced depth imaging SD-OCT which enables the clear visualization of the full thickness lamina. We also introduce a new imaging algorithm which allows the 3D in-situ evaluation of the lamina cribrosa.

VS12 MANAGEMENT OF TRAUMATIC GLAUCOMA WITH SUBLUXATED LENS USING SCLERAL FIXATED IOL AND TRABECULECTOMY WITH MMC

L. Vijaya, L. Gopal, S. Latka

Management of traumatic subluxated lens with glaucoma is demanding and complex as many variables affect its course. Multiple surgeries are needed to achieve the required outcome. We present a technique of combined primary scleral fixated IOL implantation with trabeculectomy using mitomycin C with complete conjunctival compartmentalization. This single stage sitting offers many advantages – cost-effective technique, early visual rehabilitation and good filtering bleb.

VS13 TWO-SITE PHACOTRABECULECTOMY ON COMPLICATED SECONDARY ANGLE-CLOSURE GLAUCOMA IN SINGLE SITTING SURGERY

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A 55-year-old man came in with bilateral uveitis and secondary angle-closure glaucoma. The visual acuity was HM OU and the IOP was 45 mmHg on RE and 42 mmHg on LE. Both eyes had pupillary seclusion and iris bombae. After maintaining the uveitis and decreasing the IOP, we performed two-site phacotrabeculectomy. To shorten the procedure, the surgery was done in one sitting in the temporal site.

VS14 SURGICAL TECHNIQUE OF COMBINED TRABECULECTOMY AND MANUAL SMALL INCISION CATARACT SURGERY USING A MODIFIED TECHNIQUE

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Purpose: To develop a simple and safe technique for the surgical management coexisting cataract and glaucoma.

Methods: After fornix based conjunctival flap an M-shaped scleral incision was made. The incision was extended to have a tunnel of about 6-7 mm. Nucleus delivered and IOL was placed. Deep scleral block excised and PI was done. Scleral flap and conjunctiva were apposed.

Conclusion: This is a simple and safe procedure and easy to perform with simple instrumentation.

VS15 PHACOSURGERY IN EYES WITH SHALLOW ANTERIOR CHAMBERS IN CASES OF ANGLE-CLOSED GLAUCOMA

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Purpose: Angle-closure glaucoma with a shallow anterior

chamber caused by cataract is a significant challenge for phacosurgeons and more common in Asia. This video will demonstrate the phacotechniques to manage shallow anterior chambers in such cases.

Methods: Using the appropriate ophthalmic viscosurgical devices (OVDs), fluidic settings, and surgical techniques to perform phaco in closed-angle glaucoma patients with a shallow anterior chamber.

Results: Phacosurgery is performed safely and effectively in eyes with a shallow anterior chamber.

VS16 CLASS – CO₂ LASER-ASSISTED SCLERECTOMY SURGERY

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CLASS is an alternative non penetrating deep sclerectomy (NPDS) filtering procedure.

A frequent complication of manual NPDS is inadvertent perforation into the anterior chamber, requiring conversion to a penetrating filtration procedure. Advantages of the CLASS technique include photoablation of dry tissue as well as the effective absorption of laser energy by aqueous percolation that ceases ablation 'automatically'.

The CLASS procedure simplifies manual NPDS which requires a relatively long learning curve and high surgical skills while retaining its safety characteristics.

VS17 CO₂ LASER-ASSISTED DEEP SCLERECTOMY IN OPEN-ANGLE GLAUCOMA

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Like in deep sclerectomy, a superficial scleral flap is made and the deeper lamellae along with the roof of the schlemm's canal are de-roofed using CO₂ laser, leaving a thin trabeculo-Descemet's membrane through which the aqueous percolates into the subscleral lake. CO₂ laser tissue ablation stops once the fluid starts percolating which is the desired end point. This provides uniform ablation and avoids perforation of the thin membrane. This technique offers a safe and effective non-penetrating glaucoma procedure in open-angle glaucoma.

VS18 NON-PENETRATING GLAUCOMA SURGERY MADE SIMPLE BY CO₂ LASER-ASSISTED DEEP SCLERECTOMY

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Glaucoma surgeons have very few non-penetrating glaucoma surgical alternatives to trabeculectomy. Non-penetrating glaucoma surgery has proven to minimize intra- and post-operative complications. Options include deep sclerectomy and viscocanalostomy, but they require significant skill and are time consuming. Video demonstrates laser-assisted deep sclerectomy, a technique simplified by using carbon dioxide laser to open Schlemm's canal.

VS19 ENDOSCOPIC CYCLOPHOTOCOAGULATION IN THE MANAGEMENT DIFFICULT GLAUCOMAS

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Cyclodestruction is reserved for the most intractable glaucomas. Endoscopic cyclophotocoagulation offers refinement in energy delivery, and precise localization, and some titration of IOP-lowering effect. We present a series of difficult glaucomas where vision and IOP were salvaged using this technique, when all other options were not viable, or had failed. These include neovascular, post-traumatic and post-keratoplasty glaucomas, and eyes with large scleral staphylomas. The surgical technique and its utility in such eyes will be presented.

VS20 TRABECULOTOME-GUIDED DEEP SCLERECTOMY

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Deep sclerectomy is a non-penetrating surgical procedure for the treatment of open-angle glaucoma with a superior safety profile over penetrating procedures. However, its most common intra-operative complication is trabeculo-Descemet's membrane perforation.

Trabeculotome-guided deep sclerectomy technique involves insertion of trabeculotome inside the Schlemm's canal after the superficial scleral flap dissection. During deep flap dissection, a direct incision is made over the trabeculotome to open and unroof Schlemm's canal. It reduces perforation and insures proper second flap depth.

VS21 MANAGEMENT OF INTRAOPERATIVE AND POST-OPERATIVE COMPLICATIONS WITH AHMED VALVE IMPLANT

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The preoperative precautions and intra-operative modifications with Ahmed glaucoma valve implantation are demonstrated in difficult glaucomas. Aqueous shunts or glaucoma drainage devices are often used in complicated cases when conventional trabeculectomy fails or in refractory glaucomas associated with high risk of failure of trabeculectomy. Preventing and managing the complications are important for a successful outcome. Proper preoperative and intra-operative precautions can prevent most complications associated with Ahmed Glaucoma Valve. If complications occur they should be detected and treated appropriately.

VS22 REPOSITIONING OF AN AHMED GLAUCOMA VALVE (AGV) TUBE TOUCHING THE CORNEA

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This video shows the management of tube-corneal touch causing localized corneal decompensation. A double-armed 9-0 prolene suture was passed as a sling over the tube. The tube was adjusted underneath the sutures and away from

the site of contact with cornea. On follow up, there was no tube-corneal contact, clearing of the corneal edema. In eyes with tube corneal touch with a functioning implant, this minimally invasive technique may avoid the need for a major surgical repair.

VS23 SPLIT-THICKNESS HINGED SCLERAL FLAP IN THE MANAGEMENT OF EXPOSED TUBING OF A GLAUCOMA DRAINAGE DEVICE

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Glaucoma drainage devices (GDD) have been used as an effective means for managing refractory glaucoma. However, it has been estimated that 2-7% of such patients can develop melting of the overlying patch of conjunctiva with erosion of the tube through the conjunctiva. We hereby present cases of tube exposure that were successfully managed using a novel technique for burying the exposed tubing under a split-thickness hinged scleral flap.

VS24 ENABLING RURAL GENERAL OPHTHALMOLOGISTS TO ADOPT COMPREHENSIVE GLAUCOMA CARE- THE "NAYANA" EXPERIENCE

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Tonometry, gonioscopy, visual fields, and disc evaluation are the minimum requirements for glaucoma management. Unfortunately, ophthalmologists practicing in rural India face barriers of cost and lack of training in these techniques. Many do not have access to YAG laser to address angle-closure glaucoma. We present our five-year experience of taking these equipments on a mobile platform, to 83 ophthalmologists in rural Karnataka, India. Significant change in practice patterns were observed. This is a viable model for developing countries.

VS25 SAFE AND EFFECTIVE TECHNIQUE TO TACKLE LENS INDUCED GLAUCOMA IN DEVELOPING WORLD

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Despite what modern technology has done to advance the treatment of cataracts and glaucoma, the greatest challenge in our field continues to be the large and increasing backlog of cataract and glaucoma blindness in developing countries. This video will discuss the technique of manual small incision cataract surgery (MSICS) combined with trabeculectomy to tackle safely the problem of advanced cataract with co-existing glaucoma. In addition the video will highlight MSICS technique in lens-induced glaucoma.

VS26 SURGICAL OUTCOME OF EARLY ONSET GLAUCOMA IN CHILDREN WITH AXENFELD-RIEGER ANOMALY

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The aim of this video is to highlight the surgical technique and outcome of primary combined trabeculectomy-trabeculectomy (CTT) in patients with early onset glaucoma (within three years of age) in Axenfeld-Rieger Anomaly. Forty-four eyes of 24 patients were analyzed. The success probability at the end of five years was 93%. At the final follow-up visit 44.14% of patients had a visual acuity $\geq 20/60$. Primary CTT is safe and effective for early onset glaucoma associated with Axenfeld-Rieger anomaly.

VS27 TWENTY YEARS OF COMPREHENSIVE CARE FOR CHILDREN WITH CONGENITAL GLAUCOMA

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The aim of management of congenital glaucoma is to control IOP without medication and to stimulate the development of binocular stereoscopic vision. The present video highlights the holistic care of children with congenital glaucoma which includes medical, surgical, genetic and rehabilitation approaches. Management of congenital glaucoma is a complex and difficult undertaking. A compassionate commitment from the family as well as all members of the eye care team is essential to make the children independent in school and in community.

VS28 CONGENITAL GLAUCOMA – A LEARNER'S PERSPECTIVE

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Congenital glaucoma has always interested me because of the rarity of this condition among children, the difficulty in diagnosis and the challenges involved in the ongoing management of these patients. This calls for perseverance and focused training, a deep interest in the subject and a lifelong commitment to the patients. In this video, I share my long and tedious journey as a beginner in congenital glaucoma, which has been very rewarding in the end.

VS29 REFRACTORY CONGENITAL GLAUCOMA

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Pediatric glaucoma is refractory to medications and surgery is the mainstay of treatment. About one-fifth of initial filtering surgery for primary congenital glaucoma fail within a year due to rapid wound healing and excessive scarring. Secondary glaucomas are associated with poorer success rates. Glaucoma drainage devices are important alternatives in the treatment of refractory pediatric glaucoma, especially when filtering surgery has failed. In this video, we shall demonstrate the procedure, special precautions and postoperative management of glaucoma drainage device in pediatric glaucomas.

VS30 THE DIFFERENTIAL DIAGNOSIS OF DESCMET'S TEARS (HAAB'S STRIAE) AND SURGICAL OUTCOME OF INFANTILE GLAUCOMA PRESENTED WITH ACUTE CORNEAL HYDROPS

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Descemet's Tears (Haab's Striae) most commonly occurs in

congenital glaucoma. Other etiologies include birth trauma, acute corneal hydrops in keratoconus, and accidental or surgical trauma. The present video will highlight the differential diagnosis of Haab's Striae to establish the diagnosis and surgical technique of primary combined trabeculotomy-trabeculectomy for infantile glaucoma presented with secondary hydrops between 1990 and 2009. Retrospective analysis of 19 children revealed good IOP control without medication in 17 children. The mean follow-up was 40.03 ± 51.39 months.

POSTER ABSTRACTS

General Aspects: Epidemiology

P1 RISK FACTORS FOR GLAUCOMA PROGRESSION: TORINO'S STUDY. PRELIMINARY RESULTS

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Background: This is a retrospective, observational, forward study to describe epidemiological characteristics of a sample population selected among patients of our Glaucoma Center, followed up in the last year (January 2010-January 2011). Objective of the study is to determine factors that influence damage progression of glaucoma.

Methods: 190 patients (378 eyes) with diagnosis of POAG (primary open-angle glaucoma) were included in the study. All data were included in the *Glaucoma Management System Database* program. For the first time in literature we measured damage progression evaluating MD (Mean Deviation) index regression using generalized linear model (GLM). The GLM generalizes linear regression by allowing the linear model to be related to the response variable via a link function and by allowing the magnitude of the variance of each measurement to be a function of its predicted value.

Results: In the examined sample four factors are significantly responsible of damage progression: – intraocular pressure: mean IOP in follow up (every 1 mmHg added a 11.9% increased risk of progression); – hypothyroidism (in therapy with levothyroxine); – topical and systemic corticosteroids treatment. Near to be statistically significant are: pachimetry < 510, age > 60 years, vasospastic factors, high blood pressure.

Conclusions: Hypothyroidism is particularly interesting as a significant factor responsible for glaucoma progression. This factor needs more investigation (the role of the hypothyroidism itself and the role of its therapy). All the present study will be continued, in order to understand particularly the role of vascular factors and vascular status of the optic disc (linked to vasospasm, blood pressure, diabetes ...). It is clear nowadays that treating glaucoma means considering all patient comorbidities. Only a well-done patient's clinical history and an internal medicine evaluation can help to determine a good target pressure and a good timing in follow up.

P2 ABSTRACT WITHDRAWN

P3 TRENDS IN THE USE OF OCULAR HYPOTENSIVE DRUGS BY OUTPATIENTS WITH GLAUCOMA IN TAIWAN, 1997-2007

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Background: To define the prescribing patterns of ocular hypotensive drugs (OHD) in Taiwan over an 11-year period (1997-2007), to critically comment on changes observed and

to see whether the trends are consistent with clinical trial outcomes and published guidelines.

Methods: A cross-sectional study design was implemented using data from Taiwan's National Health Insurance Research Database between January 1997 and December 2007. Outpatients who were 18 years or older and had at least an ocular hypotensive drug claim during the study period were identified. The unit of analysis was each ocular hypotensive drug prescription for glaucoma outpatient visits. The prescribing trends were described in terms of annual changes in prescribing rates and patterns.

Results: The numbers of ocular hypotensive drug prescriptions raised 2.46 fold. The β -blocker class was the most commonly used OHD, but the prescribing rates for this class reached a plateau over time. The prostaglandin analogue class was the second most frequently prescribed OHD class and its prescribing rate substantially increased since 2000. The largest increase in prescribing was for prostaglandin analogue use. The prescribing rates of new classes of OHD, α -agonist and fixed combination, also significantly increased within a short period of time. A trend towards combination therapy was observed away from monotherapy. The β -blocker class was the most commonly prescribed as monotherapy. Prostaglandin analogue plus β -blocker was the most commonly prescribed dual therapy. Prostaglandin analogue, β -blocker plus carbonic anhydrase inhibitor was the most commonly prescribed triple therapy.

Conclusion: The prescribing rates of OHDs are shifting from the older OHDs (β -blocker, miotics) to newer OHDs (prostaglandin analogue, α -agonist, carbonic anhydrase inhibitor, fixed combination). The prescribing patterns of OHDs are moving toward combination therapy, especially triple therapy. These findings may imply that management of glaucoma patients in Taiwan had a positive trend towards recent clinical trial outcomes and guideline's recommendation.

P4 CENTRAL CORNEAL THICKNESS MEASURED BY ULTRASOUND PACHYMETRY OR PENTACAM AS A PREDICTOR OF PRIMARY OPEN-ANGLE GLAUCOMA

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Background: To determine the capacity of central corneal thickness (CCT) determined by ultrasound pachymetry (UCT) or using the Pentacam (pupil axis thickness, PAT and minimum corneal thickness, MCT) to discriminate between healthy controls and patients with primary open-angle glaucoma (POAG).

Methods: UCT, PAT and MCT were determined in the right eyes of 123 control subjects and 128 POAG patients. The normality of the distributions shown by the three variables was confirmed in the two data sets (control and POAG) using Kolmogorov-Smirnov and Saphiro-Wilk tests. Differences between the two data sets for each variable were identified using a t-test for independent samples. Three univariate binary logistic regression models (to discriminate between

POAG and normality) were constructed in which the predictive variables were respectively UCT, PAT or MCT.

Results: All three variables showed a normal distribution in the two samples. Controls and patients failed to differ significantly in terms of UCT ($p = 0.06$) but did differ in terms of PAT (mean difference 22.01 microns in favour of controls; 95% CI: 11.97-32.05) and MCT (mean difference 21.675 microns in favour of controls; 95% CI: 11.36-31.94). The logistic regression model for UCT was not significant ($p = 0.06$) but significant discriminatory capacity was shown by PAT (Odds Ratio (OR) = 0.99; 95% CI: 0.98-0.99; sensitivity: 58.5%; specificity: 64.8%) and MCT (OR = 0.99; 95% CI: 0.98-0.994; sensitivity: 56.9%; specificity: 64.1%).

Conclusions: CCT measures determined using the Pentacam (PAT and MCT) showed a similar yet not inappreciable capacity to discern between the control and glaucoma patients considering this is not an *ad hoc* diagnostic test for glaucoma. In contrast, CCT determined by pachymetry (UCT) lacked this capacity.

P5 BILATERAL IRIDO-CORNEAL ENDOTHELIAL SYNDROME: A CASE REPORT

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Background: Iridocorneal endothelial syndrome is a rare disease, which encompasses a spectrum of conditions, including Chandler's syndrome, Reese-Cogan syndrome and progressive iris atrophy. ICE syndrome usually presents as a non familial, unilateral condition, however, more rare bilateral cases has been seen. It is characterized by corneal endothelial abnormality, with presence of an abnormal membrane over the trabecular meshwork, causing peripheral anterior synechiae, iris stromal abnormalities and secondary glaucoma. The objective of the paper is to report a case of bilateral ICE syndrome as seen at the Philippine General Hospital, to discuss the pathophysiology, clinical signs and symptoms and management of bilateral ICE syndrome.

Methodology: This is a case report of a 12 year old female who presented with 1 year progressive blurring of vision of both eyes associated with polycoria, corectopia, iris atrophy and increased Intraocular pressures as seen in the clinics of UP-PGH. Work up done includes specular microscopy, disc photo and perimetry.

Result: A 12-year old female who presented with 1 year progressive blurring of vision of both eyes associated with polycoria, corectopia, iris atrophy and increased IOP. On specular microscopy, there is note of decreased cell density, polymegethism, pleomorphism and some black cells with some indistinct borders. Disc photo of both eyes showed increased Cup to Disc Ratio 0.9 on right, 1.0 for the left with thinning of the temporal rim of the optic disc, large peripapillary atrophy, retinal atrophy around the disc and tigroid fundus. It showed glaucomatous damage and myopic changes for both eyes. Automated visual fields showed deep local depression over the temporal and paracentral area, considered as early glaucomatous changes for the right eye. For the left eye, there is deep generalized depression over the inferior hemifield, threatening fixation, seen as an inferior arcuate scotoma, indicating severe glaucomatous changes. Patient's secondary glaucoma was managed by placing Baerveldt and Molteno valves to the right and left eyes

respectively, to control the increased intraocular pressures.

Conclusion: Bilateral ICE syndrome is a rare condition. Management of such include documentation of abnormal endothelium and glaucoma work up. Secondary glaucoma can be managed using medications, filtering surgeries and glaucoma drainage devices.

P6 CORRELATION OF GLAUCOMA INCIDENCE AND PREVALENCE WITH OTHER FACTORS IN UKRAINE

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Aim: To evaluate special features of the incidence and prevalence of glaucoma in Ukraine in the period from 2001 to 2007.

Results: The incidence of glaucoma in Ukraine increased from 47 to 65,1 (+29.6%), and the prevalence – from 370 to 542.2 (+36.7%) per 100 000 of population in the period from 2001 to 2007.

The increment rate of the incidence was 11.4% per year and prevalence – 5.9% per year. The level of incidence was higher among urban population (coefficient > 1.2), and among disabled person (coefficient > 2.2) in 70.4% of regions. The coefficient of accumulation of pathology was 8.1. It was the highest index among all ophthalmological pathology. We have observed linear correlation between glaucoma incidence and incidence of cerebrovascular diseases ($r = 0.47$), diabetes ($r = 0.46$), genito-urinary diseases ($r = 0.81$), ischemic heart disease and diseases of blood circulation ($r = 0.36$).

Conclusions: The increasing of incidence and prevalence of glaucoma in Ukraine reflects worldwide tendency and requires deep analyses of real causes. Observed correlation is the base for development the methods of prophylaxis, increasing of medical care quality.

P7 MODE OF PRESENTATION, AWARENESS AND SEVERITY OF GLAUCOMA AT PRESENTATION IN AN URBAN CENTER IN NORTHERN NIGERIA

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Background: Glaucoma is responsible for 16% of blindness in Nigerian adults. Glaucoma is more blinding in Africa than in other regions due to the higher prevalence and more aggressive natural history. In addition, patients present very late, usually only when they have extensive field and/or visual loss; they often do not accept or adhere to treatment and follow up is poor. These factors influence management decisions and need to be taken into account when deciding which interventions to assess in clinical trials. The aim of this study was to determine: the severity of primary glaucoma at presentation; the level of awareness of the disease amongst patients; and rates of compliance with treatment amongst patients presenting to a university eye clinic in Bauchi, northern Nigeria.

Methods: All consecutive patients aged ≥ 30 years attending

the clinic over a 3-month period in 2010 were assessed for glaucoma through history and examination. Examination entailed visual acuity measurement (Snellen's E chart); refraction (ARKM100 autorefraction); pupillary reflexes (RAPD), and direct, undilated ophthalmoscopy. Those with a VCDR of > 0.6 in one or both eyes had intraocular pressure measurement (Goldman Applanation Tonometry), gonioscopy and visual field analysis (Oculus Twinfield). Treatment choices were offered and patients asked to come back after 1 month. They were also asked to invite their first degree relatives for free assessment.

Result: 131 cases of primary glaucoma were recruited from 6291 outpatients. Their mean age was 52 years (range 30-89 years), 40.7% were females. 22.1% had family history of glaucoma, but 80% knew nothing about glaucoma. 66.4% were bilaterally blind at presentation (i.e. < 3/60 in their better eye). The mean IOP (all eyes) was 31 mmHg and the mean VCDR was almost 0.9 (0.86 ± 0.1). The majority of patients had presented to the hospital with symptoms (70%); 14% had been referred by colleagues; 8% were first degree relatives of new cases and 8% attended the hospital for other conditions. Trabeculectomy was the treatment of choice for 63 eyes: 17 patients agreed to the procedure but only one returned for surgery during the study. Fear was the commonest reason for not accepting surgery. Only a quarter of patients (24.4%) attended follow up at one month. Only 65 of the 259 (25.1%) first degree relatives attended for assessment.

Conclusion: This study confirms that in the virtual absence of primary eye care in Africa, glaucoma patients present very late. There is very poor awareness about glaucoma and its treatment. Surgical treatment is not accepted, and follow up inadequate. There is reluctance by first degree relatives to present for assessment. There is a need to develop a locally acceptable health education package to improve awareness so that patients not only present earlier but also accept and adhere to the treatment recommended.

P8 EPIDEMIOLOGY OF CLINICAL FORMS OF GLAUCOMA IN A PARIS SUB-SPECIALTY CENTER

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Background: Clinical care of glaucoma must be individualized to the specific forms of the disease. The aim of this study was to evaluate the relative frequencies of clinical types of glaucoma on first referral to our glaucoma center.

Material and Methods: This is a prospective epidemiological screening of all consecutive glaucoma patients, either referred by their ophthalmologist, or who came on their own to our glaucoma center between May and August 2010. All patients had a glaucoma check-up including: general and ocular histories (family history of glaucoma, general diseases) intraocular pressure measured with Goldmann applanation tonometry, central corneal thickness (CCT), indentation gonioscopy, slit lamp examination, optic nerve head evaluation, and automated visual field examination. Patients were then classified according to the European Glaucoma Society guideline, as Ocular hypertension (OH), Primary Open Angle Glaucoma (POAG) including Normal pressure Glaucoma (NPG), secondary open angle glaucoma (SOAG), primary angle closure (PAC) including primary angle closure glaucoma (PACG), and secondary angle closure glaucoma

(SACG). We also studied several risk factors: race, age, gender, disease duration, refractive error.

Results: A total of 386 adults (769 eyes) were included. 162 patients were male (42%) and 224 female (58%) with a mean age of 58.6 ± 15.8 years. 300 patients were Caucasian (77.7%) 42 African (10.9%), 33 Oriental (8.5%), 9 Asian (2.3%). We found 97 eyes OH (10.4%), 344 POAG (44.7%), 8 NTG (1%), 52 SOAG (6.8%), 170 PAC (23%) including 112 PACG (16.4%), and 5 SACG (0.5%). 13.7% were one eyed. 47.4% patients had a positive family history of glaucoma. Pigment dispersion was observed in 7.8% of OAG and exfoliation in 5% of OAG. Mean CCT was $564 \pm 47.02 \mu$ in OHT; $540 \pm 42.6 \mu$ in OAG and $549 \pm 36.01 \mu$ in ACG. In the ACG groups 75.3% were Caucasian and 48 % were hyperopic; 26.9% emmetropic and 8.9 % myopic. 12.6% had plateau iris syndrome or configuration.

Conclusion: The most remarkable finding of this study is that angle closure glaucoma is much more frequent in our predominantly Caucasian population, than previous studies of Europeans would suggest [1]. Normal tension glaucoma is a rare disease. Even in totally asymptomatic quiet eyes, the diagnosis of open angle glaucoma can be made only after careful gonioscopy to exclude unsuspected angle closure.

Reference: 1. Quigley HA, Broman AT: The number of people with glaucoma worldwide 2010 and 2020. Br J Ophthalmol 2006; 90: 262-7.

P9 ROLE OF GLAUCOMA SOCIETIES IN DEVELOPING COUNTRIES

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Background: To explain the problems faced by glaucoma societies and why it is difficult to treat glaucoma in developing countries. How to solve and how to maximize the efforts to increase the care for glaucoma patients and CME to ophthalmologists.

Methods: Glaucoma societies should exert hard efforts to prevent the expected rise of glaucoma blind people from 60 million to nearly 80 million by year 2020. This could be executed by adopting the 'Right to Sight' or 'Vision 2020' launched by WHO, through health education programs, training programs to ophthalmologists, national programs for control of blindness, mobile ophthalmic units and constructing primary, secondary, tertiary eye care centers.

Results: A plan of action by glaucoma societies and ministry of health should be carried out to combat blindness.

Conclusion: The suggested strategies set for glaucoma prevention of blindness are constructing an infrastructure and support for primary eye care, providing human resources development and training, and offering models for service delivery and community participation.

P10 CARDIOVASCULAR RISK FACTORS, MALE GENDER PREDOMINANCE, AGING AND BURDEN OF CHRONIC OCULAR DISEASES IN AFRICANS WITH GLAUCOMA

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Background: Glaucoma is one of the leading causes of blindness worldwide. Cardiovascular diseases (CVD) are now emerging in Black Africans in the course of their demographic transition. The objective of the study was to describe the extent of arterial hypertension, type 2 diabetes, aging, gender influence, and degenerative ocular diseases in glaucomatous patients.

Methods: A cross-sectional sample of glaucoma suspects was interviewed in the outpatient department regarding demographic and personal history of cardiovascular diseases. A comprehensive ophthalmic assessment was conducted. This included: visual acuity, refraction, slit-lamp biomicroscopy, gonioscopy, applanation tonometry, automated tangent visual field testing and stereoscopic disc evaluation. Outcomes included aging (age > 60 years), arterial hypertension, type 2 diabetes, definite primary acute open-angle glaucoma (PAOAG), optic disc changes, visual field defects, and vision loss (blindness and visual impairment).

Results: All eligible patients (n = 67) agreed to participate in the study (response rate of 100%). There was a male:female ratio of 5:1 and a mean age of 54.2 ± 16 years. Analysis of the data showed the following results: Age > 60 years (52.2%), arterial hypertension (19.4%), type 2 diabetes (11.9%) and POAG (100%). The onset from symptoms to diagnosis was < 5 years in 80.6% patients. Visual field defects were noted in 55.2%, severe optic disc damage in 71.6%, myopia in 32.8%, hypermetropia in 22.4%, and vision loss in 29.9%.

Conclusion: The high level of cardiovascular risk factors in this cohort of glaucoma suspects is significant. Prevention and appropriate management of CVD risk factors and glaucoma in Black Africans is needed.

P11 FIVE-YEAR INCIDENCE OF OPEN-ANGLE GLAUCOMA IN ELDERLY CHINESE

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Background: To our best knowledge, the incidence and risk factors of glaucoma in Chinese population have not been documented. We attempt to report the 5-year incidence and risk factors of open-angle glaucoma (OAG) in an elderly Chinese population in urban China.

Methods: Subjects who participating the Liwan Eye Study in 2004 were invited to come back for an eye examination in 2009. Intraocular pressure, gonioscopy, optic disc, visual field, height, weight and blood pressure were examined as per a standard protocol. Glaucoma was diagnosed and defined based on the ISGE definition.

Result: Of 1081 subjects eligible for 2009 examination (after excluding 177 died, 147 permanently moved out from the area), 874 people (80.9%) attended the follow-up examination. Among 837 subjects without any glaucoma at baseline, 11 people developed definite OAG (5-year cumulative incidence 1.3%, 95% CI 0.7%-2.3%) in either eye. The incident OAG was associated with baseline IOP (IRR 1.30, 95%CI 1.14-1.49, $p < 0.05$) but was not associated with age, gender, BMI, ocular biometry, vascular factors including MAP (mean arterial pressure), SPP (systolic perfusion pressure), MOPP (mean ocular perfusion pressure), DPP (diastolic perfusion pressure).

Conclusion: 5-year cumulative incidence of glaucoma was 1.3% and it was associated with higher baseline IOP.

P12 AWARENESS OF GLAUCOMA MANAGEMENT AND CAUSES OF MEDICAL THERAPY NONCOMPLIANCE IN BLACK AFRICAN PATIENTS

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Background: Glaucoma is one of the leading causes of hospitalization and blindness worldwide. Compliance on medical therapy is poor. We hypothesize that this is due to the following factors: a lack of education, ineffective and inefficient management, poverty and the poor quality of doctor-patient relationship. The objective of the study was to verify this hypothesis.

Methods: A cross-sectional study was undertaken using a structured questionnaire administered to African glaucoma patients admitted to Ophthalmology Division, Teaching Hospital of Kinshasa, DR Congo. The Knowledge, attitudes and Practice (KAP) method of World Health Organization was used to collect information about awareness of diagnosis, glaucoma treatment purpose, prescribed drugs, satisfaction after drug administration, duration of treatment, and self reported noncompliance to glaucoma therapy.

Results: The sample included 67 African glaucoma patients. Their mean age was 54.2 ± 16 years. 56 males and 11 females were assessed. The outcome revealed that only 11% were aware of glaucoma diagnosis from doctors, 80% were not aware of their prescribed Glaucoma medication, 35.8% of the treatment duration, 26.9% the purpose of the treatment, and 92% of the prognosis for vision. The rate of self reported noncompliance to glaucoma therapy was 68.5%. Glaucoma therapy was considered not effective by 75% and 65.6% were dissatisfied with treatment. The significant independent causes of noncompliance to glaucoma therapy were lack of money, undefined treatment duration, and shortage of drugs.

Conclusion: Better patient education by doctors, interventions directed at the attitudes of patients, the quality of doctor-patient relationships and drug supply may improve treatment compliance in Black African glaucoma patients.

P13 PREVALENCE OF DIABETES AND HYPERTENSION IN GLAUCOMA PATIENTS AND EVALUATION OF SYSTEMIC THERAPY

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Background: Systemic Hypertension and Diabetes mellitus are common associations with primary glaucoma in adults. We evaluated the prevalence, systemic control and the adequacy of therapy of Diabetes mellitus (DM) and Hypertension (HT) in glaucoma population visiting a tertiary care eye facility at a university hospital.

Methods: Consecutive glaucoma cases attending the outpatient services were evaluated for the presence of DM and HT and any systemic / ocular medications being taken were recorded. Their blood pressure (BP) and fasting blood sugars

(FBS) were evaluated. Control levels for BP were kept at = 130/80 mmHg for diabetics and 140/90 mmHg for non-diabetics. Diabetes was considered controlled at FBS = 130 mg%.

Results: Of three hundred and forty five glaucoma cases evaluated 160 (46.37%) were POAG and 185 (53.62%) were PACG. Mean age was 57.90 ± 11.19 years with males comprising 60.86% of study group. One hundred and sixty five (47.82%) glaucoma patients had HT and 103 (29.85%) glaucoma patients had DM including 55 (15.94%) patients who had both. Seventy seven (48.12%) patients of POAG had HT while 88 (47.56%) patients with PACG had the same. Fifty four (33.75%) POAG patients had DM while 49 (26.48%) PACG patients were diabetics. Ninety two (55.75%) hypertensives had blood pressure above control levels and 52 (50.48%) diabetics had uncontrolled blood sugars. Only 7 (12.72%) patients with both the systemic diseases were adequately controlled. The medications being used for HT were amlodipine, atenolol, enalapril, losartan and hydrochlorothiazide. Diabetics had been prescribed metformin, glibenclamide, glipizide, rosiglitazone, pioglitazone and insulin. Among the hypertensives 93 (56.36%) patients were on topical β -blocker (0.5%timolol), 62 (37.57%) were on topical α -agonist (0.15%brimonidine) and 39 (23.63%) were on oral β -blocker (atenolol). Fifty four (52.42%) diabetics were on topical β -blocker. Fifteen (9.09%) patients were found to be on combined systemic and topical β -blocker therapy.

Conclusion: A large majority of adult glaucoma patients had concurrent systemic disease, which was not adequately controlled. Patients were using systemic medications with known interactions with ocular hypotensive medications. Health education with emphasis on systemic diseases and its impact on glaucoma therapy should be an integral part in the management of a glaucoma patient. This study thus emphasizes a need for better coordination between medical physicians and glaucoma specialists.

P14 ASSOCIATION OF OPEN-ANGLE GLAUCOMA WITH PERFUSION PRESSURE STATUS IN THE THESSALONIKI EYE STUDY

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Background: To investigate the association of open-angle glaucoma (OAG) with perfusion pressure (PP) status (PP level with or without anti-hypertensive treatment [anti-HTN]) in the Thessaloniki Eye Study (TES).

Methods: TES is a cross sectional population-based study of chronic eye diseases in subjects ≥ 60 years of age in Thessaloniki, Greece. Among 2261 clinic-visits, 135 OAG cases were identified. Diastolic PP (DPP) and systolic PP (SPP) were calculated. Subjects were divided into 6 groups: low DPP ($< 20^{\text{th}}$ percentile) with ($n = 234$) or without anti-HTN ($n = 214$), median DPP ($20^{\text{th}}\text{--}80^{\text{th}}$ percentile) with ($n = 710$) or

without anti-HTN ($n = 640$), and high DPP ($> 80^{\text{th}}$ percentile) with ($n=268$) or without anti-HTN ($n=185$). Subjects were also divided into 6 groups of SPP status accordingly. Percentages of OAG in groups were compared using logistic regression models with median DPP and median SPP without anti-HTN groups as references. Adjustments were made for age, gender and vascular factors identified as risk factors for OAG in a previous analysis (coronary artery bypass or vascular surgery and diabetes treated with insulin).

Results: The 20^{th} and 80^{th} percentiles for DPP were 58.5 mmHg and 79 mmHg respectively; for SPP they were 110mmHg and 147.5mmHg respectively. Low DPP with anti-HTN group presented with statistically significantly higher odds for OAG compared to the reference group (Odds Ratio, 2.02, 95% Confidence Interval, 1.16-3.52, $p = 0.013$). Low DPP without anti-HTN, high DPP with or without anti-HTN and median DPP with anti-HTN groups were not associated with OAG. Also, none of the SPP status groups were associated with OAG.

Conclusions: This is the first study reporting that low DPP is associated with increased likelihood for OAG only in subjects receiving anti-HTN, while low DPP in subjects without anti-HTN is not associated.

P15 NEURAL RIM WIDTH CHARACTERISTICS (ISNT RULE) OF OPHTHALMOLOGICALLY NORMAL JAPANESE DETERMINED IN A POPULATION-BASED STUDY: THE KUMEJIMA STUDY

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Purpose: The neuroretinal rim shows somewhat characteristic configuration in the normal subjects, and Jonas et al (IOVS, 1988) reported that the rim was broadest at 6 o'clock position (I), followed by that at 12, 3 (right eye) and 9 (right eye) o'clock position (S, N and T, respectively) in 457 normal Caucasians (ISNT rule). This rule is often used in clinical practice to facilitate detection of glaucoma. Since inter-ethnic difference in disc morphology is known, the pattern of difference among I, S, N and T rim width may be different in ethnical groups other than Caucasians. However, a population-based study rarely reported statistics of I, S, N and T rim width except that Aravind et al (IOVS, 2008) reported several interesting findings including that mean rim width is greater in N than S in healthy south Indians. We analyzed the rim width data obtained from a normal participants of a recent population-based study performed in a southwest island of Japan (Kumejima Study).

Method: In the Kumejima Study, 3762 subjects (81.2% of the eligible residents aged ≥ 40 years) participated in the ophthalmologic examinations including sequential stereoscopic disc photography. Excluding eyes being not qualified for analyses such as those with unsatisfactory image quality, glaucoma or other ocular abnormalities, pseudophakia, or aphakia, stereo-photographs of both eyes of 2311 ophthalmologically normal subjects were used for analyses. While stereoscopically viewing the disc, disc and cup contours were drawn and magnification corrected, and I, S, N and T rim

width were determined using the method we previously reported (Saito et al. Ophthalmology, 2009).

Result: Since I, S, N and T rim width showed significant inter-eye correlation ($r = 0.63 - 0.48$, $p = 0.000$), the right eye data were presented. I, S, N and T rim width averaged 0.47, 0.37, 0.44 and 0.29 mm, respectively. INST (37.8%) was the most common pattern followed by NIST (25.4%), ISNT (10.3%), NSIT (7.2%), INTS (7.1%), SINT (2.1%), SNIT (2.1%), NITS (1.7%). I rim width was broader than S in 62.3% of eyes, I rim width the broadest in 59.6%, N in 34.9%, S in 5.2%, T in 0.3% of eyes. Multiple regression analysis indicated that younger age correlated with broader rim width at all positions, larger disc size with narrower S, N and T rim width, but broader I rim width, higher IOP narrower I and N rim width, higher diastolic blood pressure (BP) broader S rim width, male gender broader S rim width and female gender broader I rim width.

Conclusion: ISNT pattern was not the most common pattern of rim width difference in normal Asian (Japanese) eyes, while INST pattern was the most common. Age, gender, diastolic BP, disc size and IOP significantly influenced all or a part of the S, N and T rim width. It was interesting that effects of diastolic BP, gender and IOP was different between I and S rim width.

P16 OUT-PATIENT CLINIC BURDEN AND SURGICAL OUTPUT OF GLAUCOMA IN THE MEGACITY OF LAGOS, NIGERIA

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Background: Glaucoma is the second commonest cause of blindness and foremost cause of irreversible blindness in Nigeria, and surgery has been advocated as the mainstay of treatment in the African population. The proportion of out-patient visits due to glaucoma is generally believed to be high, but there is a need to know exactly how high. There is also paucity of information on the number and types of glaucoma surgeries being performed.

Methods: This was a multi-center cross-sectional survey in Lagos city, Nigeria. All but one government hospitals (tertiary and secondary centers) with at least one ophthalmologist or senior registrar in ophthalmology, and a large private eye hospital were the study sites (a total of twelve sites evenly distributed across the state). Data on out-patient department (OPD) visits were collected over a four-week period from ten study sites, using a specially designed tally sheet. Information collected on each clinic day included total visits, total glaucoma visits, and new glaucoma visits. This was Institutional visits and review of theatre records over a one-year period (2009) was done to obtain information on total number of surgeries, number and types of glaucoma surgeries. Institutional data was collected from all 12 study sites. Data entry and analysis was done using SPSS 17.0, Microsoft excel and Stata /IC 11.1.

Results: A total of 6240 patients visited the OPD over the four-week period, out of which 1577 (25.3%) were glaucoma patients. The tertiary centers had the highest average OPD visits (1232), while the secondary centers had the lowest (462). However, the secondary centers had the highest OPD visit per ophthalmologist (323 Vs 274) and per doctor (129

Vs 63) compared with the tertiary centers. New glaucoma presentations were 208 (average per hospital = 22), but only 138 (66.4%) (average per hospital = 14) were previously unaware of their diagnosis. A total of 4050 surgeries were performed over the one year period, and glaucoma surgeries constituted 336 (8.6%). Number of glaucoma surgeries per ophthalmologist per month in the tertiary, secondary and private centers was 0.5, 0.9 and 1.4 respectively. Trabeculectomy with intra-operative 5 fluorouracil was the commonest procedure (272 / 81.0%). Laser surgeries 44 (13.1%) were carried out only in the private hospital.

Conclusion: Glaucoma visits constitute a significant proportion of eye clinic visits in Lagos state, Nigeria, and therefore necessary manpower, infrastructure and equipments should be put in place at all levels of eye care for its optimal management. There is also a need to strengthen the secondary eye care centers in the state with the adequate manpower for them to function effectively as the bridging gap between the primary and tertiary centers. There is a relatively low output of glaucoma surgeries, and this needs to be further investigated from the patients' and providers' perspective and appropriate measures taken to manage it.

P17 ANTERIOR CHAMBER DEPTH AND ITS ASSOCIATIONS WITH OCULAR AND GENERAL PARAMETERS IN ADULTS IN RURAL CENTRAL INDIA. THE CENTRAL INDIA EYE AND MEDICAL STUDY

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Background: To investigate the normative data of anterior chamber depth and its associations in adults in rural Central India.

Methods. The population-based Central India Eye and Medical Study included 4711 subjects (aged 30+ years) of 5885 eligible individuals (response rate, 80.1%). The subjects underwent an ophthalmologic examination including measurement of the anterior chamber depth by sonography and chamber angle by slit lamp assisted biomicroscopy and gonioscopy.

Results: After excluding pseudophakic or aphakic eyes, anterior chamber depth measurements were available for 9057 eyes of 4615 (98.0%) subjects with a mean age of 49.1 \pm 13.2 years (range:30-100 years) and a mean refractive error of -0.11 ± 1.77 diopters (range:-21.75 to +7.75 diopters). Mean anterior chamber depth (ACD) was 3.22 ± 0.34 mm. In multivariate analysis, a shallow chamber depth was significantly associated with higher age ($p < 0.001$), female gender ($p < 0.001$), shorter body stature ($p = 0.003$), hyperopic refractive error ($p < 0.001$), higher lens thickness ($p < 0.001$), and shorter axial length ($p < 0.001$). In a similar manner, the anterior chamber angle width as assessed by slit lamp assisted determination of the peripheral chamber depth (van Herick's and Foster's method) was significantly associated with younger age ($p < 0.001$), male gender ($p < 0.001$), lower hyperopic refractive error ($p < 0.001$), higher axial length ($p < 0.001$) and deeper anterior chamber ($p < 0.001$).

Anterior chamber depth was significantly associated with the anterior chamber angle width.

Conclusions: In the rural Central Indian population, a shallow anterior chamber was associated with higher age, female gender, short body stature, hyperopia, thick lens, and shorter axial length. As a corollary, the anterior chamber angle was narrower in elderly female hyperopic subjects with a short axial length. Compared with population-based data from East Asia (China), the anterior chamber was markedly deeper in India. The data may be helpful to explain anatomic relationships of the anterior segment of the eye, to elucidate risk factors of angle-closure glaucoma, and to explain ethnic differences in the prevalence of angle-closure glaucoma.

P18 A DIARY OF GLAUCOMA CASES FROM A RURAL GENERAL OPHTHALMIC PRACTITIONER OF A DISTRICT TOWN IN EASTERN INDIA

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Background: The general ophthalmic practitioners in the rural areas are the first group of eye specialists who used to come across the glaucoma suspects in the community. Without sophisticated state of the art gadgets, these ophthalmologists have to diagnose the cases and to refer them to the advanced center for further investigations in quest of better rationalized management. Here is such a diary of a general ophthalmologist who is practicing in a rural district town for more than three decades. It has shown as birds eye view of the epidemiology of glaucoma cases in Eastern India. This study is aimed for a proper planning for intervention in regard to Glaucoma Care Service for the Community at large within limited resources.

Methods: 100 consecutive (at random) established cases of glaucoma were selected from the Diary who were under the care of the ophthalmologist within one year to thirty years. All were primarily examined and diagnosed provisionally as glaucoma by external ocular examination, visual acuity, direct ophthalmoscopy and Schiotz tonometry at the first visit to the ophthalmologist. Then the diagnosis was well established by further sophisticated instruments like applanation tonometry, automated perimetry and OCT at referral center. All the patients were managed at the beginning by the ophthalmologist by both medication (topical drops and systemic Acetazolamide, etc.) and surgery (trabeculectomy) whichever was found necessary. In many cases they had been subsequently treated at higher centers by laser iridectomy, trabeculotomy, etc.

Result: There is no significant sex preponderance. In 65% cases one eye is involved and the other remains within normal limit for the first five years or so. 25 % cases reported with marked visual loss in one eye (almost up to counting finger at one foot or only PL) at the first visit. The distribution of the type of glaucoma amongst the 100 cases are as follows: – 4% congenital glaucoma, 8 % aphakic or pseudophakic glaucoma, 15 % normotensive glaucoma, 5% chronic angle-closure glaucoma, 15% acute congestive glaucoma (of them 10% are following hypermature morgagnian cataract), 42% chronic simple glaucoma, 7% neovascular glaucoma, 1% from other causes like spherophakia, 3% absolute glaucoma etc. 98% of the patients continue regular treatment after diagnosis.

Conclusion: Chronic simple glaucoma and normotensive glaucoma are the silent major causes of blindness in this region. Though an abundant cataract operation facilities are available even in rural areas, still ignorance lead to cataract glaucoma. However, compliance with regular treatment is noteworthy amongst the glaucoma patients which definitely indicate that timely detection of the disease will reduce the burden of blindness from glaucoma from the community.

P19 INFLUENCE OF SCAN QUALITY ON CONFOCAL SCANNING LASER OPHTHALMOSCOPY AUTOMATED SHAPE ANALYSIS WITHIN THE BRIDLINGTON EYE ASSESSMENT PROJECT

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Introduction: The Heidelberg Retinal Tomograph (HRT) contains a number of data analysis tools designed to assist in identification of glaucomatous damage. These may be confounded by differences in scan quality.

Purpose: To determine the effect of scan quality on GPS in a normal elderly population.

Design: Population based cross sectional observational study.

Participants: 6812 normal eyes (defined with visual fields and intraocular pressures) of 3460 subjects (mean age 72 years, range 65 – 89 years) from The Bridlington Eye Assessment Project.

Methods: Patients underwent optic nerve imaging using HRT2. Scan data was imported into a later version of the device for calculation of GPS.

Results: MPHSD ranged from 8-258 μ m, with mean 34 μ m (SD 25 μ m). MPHSD and Cup-Disc ratio were significant covariates ($p < 0.001$) within a generalised linear model with the global GPS score as the dependent variable.

MPHSD was significant even when scans with MPHSD > 50 μ m were excluded ($p < 0.001$). MPHSD was not significant when scans with MPHSD > 30 μ m were excluded from the analysis ($p = 0.17$)

Conclusion: MPHSD may be confounded by disc morphology. GPS should be interpreted with caution in scans acquired with MPHSD > 30 μ m.

General Aspects: Population Genetics

P20 EPIDEMIOLOGY OF EXFOLIATION IN AN ISOLATED GREEK VILLAGE

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Purpose: To evaluate the prevalence of exfoliation (XFS) in Taxiarchis and familial pattern of occurrence of lysyl oxidase-like protein 1 (LOXL1) polymorphisms with XFS in this isolated village population.

Methods: Eight hundred fifty-nine villagers from Taxiarchis,

an isolated village at the top of Mt. Holomonta, were enrolled in a clinical and genetic study. Participants underwent a detailed ophthalmological exam. The LOXL1 SNPs, rs1048661 and rs3825942, were sequenced bi-directionally. **Results:** We examined 541 of the villagers for exfoliation. Twenty-two individuals (all greater than 50 years old) had XFS of which 13 had exfoliation glaucoma (XFG). The resulting prevalence of XFS in individuals over 50 years old is 9.7% and in those over 70 years old is 19.1%. The 22 XFS subjects were included in twelve pedigrees, which may share common ancestral founders. Seven of the families consists of trios whereas five of these pedigrees are multigenerational. Notable among these are one pedigree in which all four affected individuals are homozygous for both LOXL1 risk alleles and in another all four XFS individuals carry the Thr377Met MYOC mutation. There is no evidence for maternal inheritance of XFS in this kindred.

Conclusions: The prevalence is much lower in this village compared to published reports to other regions in Greece. It is comparable however to published results from other isolated populations in the world.

P21 OCULAR, DEMOGRAPHIC AND GEOGRAPHIC FEATURES OF EXFOLIATION GLAUCOMA IN TWO US-BASED HEALTH PROFESSIONAL COHORTS

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Background: Most prior epidemiological surveys on exfoliation syndrome (ES) have included racially homogeneous populations drawn from geographically discrete areas, limiting the ability to discover novel determinants of this condition. Stein et al.,¹ using a de-identified database, reported that most recent residence in the southern tier of the continental United States (US) relative to residence in middle tier was associated with a reduced risk of ES and exfoliation glaucoma (EG) in a multivariable model controlling for age, race and other factors. The purpose of this work is to describe ocular, demographic and geographic features associated with EG in two health professional cohorts, where participants are located throughout the continental US, an area spanning 15 degrees of latitude. There is detailed identifiable information regarding childhood and young adulthood residence as well as other covariates in these cohorts.

Methods: We included 78,955 women in the Nurses Health Study and 41,317 men in the Health Professionals Follow-up Study in this prospective study. Participants were followed during the periods 1980-2008 and 1986-2008, respectively. Eligible participants were 40+ years old, did not have EG at baseline and reported receiving eye examinations during follow-up. Information regarding demographic features, potential confounders and geographic residence at birth, age 15, age 25 and at last follow-up was collected. During follow-up, 275 EG cases were confirmed with medical record review. We estimated relative risk of EG in each cohort separately and pooled results with meta-analysis. The main outcomes were pooled multivariable rate ratios (pMVRR) of ES and their 95% confidence intervals (95% CI).

Results: EG was strongly age related with subjects ≥ 75 years old at 44-fold increased risk compared to those aged 40-55 years (pMVRR = 44.3; 95% CI: 21.9 – 90.0). While

men were 73% less likely to develop EG than women in multivariable analysis (MVRR = 0.36 95% CI: 0.23 – 0.46), no racial predisposition to EG emerged. Compared to living in the Northern tier of the continental US at birth and at age 15, living in the middle (pMVRR = 0.57; 95% CI: 0.45-0.73) and southern tier (pMVRR = 0.29; 95% CI: 0.14-0.61) was associated with a reduced risk of EG. Similar trends were noted when we examined most recent residence in relation to EG (data not shown). In a model accounting for residence at various time periods (birth, age 15, age 25 and most recent), we found only residence at age 15 in the middle (pMVRR = 0.57; 95% CI: 0.34-0.98) and southern tier (Pmvrr = 0.39; 95% CI: 0.16-0.99) relative to the northern tier was significantly related to EG.

Conclusions: In this US-based cohort, racial group was not a risk factor for EG. Attributes associated with living in the middle and southern US continental tier during childhood are associated with a reduced risk of developing EG.

Reference: 1. Stein JD, Pasquale LR, Talwar N, et al. Geographic and climatic factors associated with exfoliation syndrome. Arch Ophthalmol 2011; accepted, in press

P22 HERITABILITY OF GLAUCOMA TRAITS: A REVIEW OF TWIN AND FAMILY STUDIES

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Background: The purpose was to collate and summarize the findings of ophthalmological heritability studies, and to compare family and twin studies and methods of heritability estimation.

Methods: We searched on the four main research websites using nine keywords. No date or language limitations were applied. Any study that reported a heritability estimate for an ophthalmic trait or allowed one to be calculated from the data provided was included. We grouped the various studies broadly by phenotype.

Results: 82 articles were retrieved: 37 were concerned with glaucoma, 28 with refraction, 4 with ARMD, 5 with diabetic retinopathy and 4 with cataract. The highest reported heritability for an ophthalmic trait is 0.95 for central corneal thickness, indicating that observed variation in this parameter is largely governed by genetic factors. Conversely, corneal fluorescence has been shown to be non heritable with variation wholly attributable to environmental influences. Over 60% of the studies employed a twin study design and a similar percentage utilized variance components methods and structural equation modeling (SEM) to derive their heritability values. Using modern SEM techniques, heritability estimates derived from twin subjects were generally higher than those from family data.

Conclusion: In this systematic meta-analysis we have compiled a concise archive of heritability studies in ophthalmology. Many of the estimates are in the moderate to high range, but to date the majority of genetic variants accounting for these findings have not been uncovered. Much work remains to fully elucidate their molecular etiology.

P23 PHENOTYPE OF JOAG IN A LARGE MALAY FAMILY WITH MYOCILLIN ASN480LYS MUTATION

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Purpose: To describe the phenotype and to identify the presence of myocillin gene variants in a Malay family with juvenile open-angle glaucoma.

Method: A 37-year old Malay gentleman, our index case of JOAG with a strong family history of glaucoma was identified in University Malaya Medical Centre, Kuala Lumpur in 2003. Family members were traced throughout Malaysia and were examined for signs of glaucoma which included the measurements and assessments of intraocular pressure, optic disc, automated perimetry, central corneal thickness (CCT) and imaging of the optic disc/retinal nerve fiber layer with Heidelberg Retinal Tomograph (HRT) II and/or Optical Coherence Tomography. Peripheral venous whole blood from these subjects was collected for genomic DNA extraction and MYOC gene screening. Patients were diagnosed with JOAG if they presented with an IOP greater than or equal to 22 mmHg in either eye by applanation tonometry, open iridocorneal angle on gonioscopy, characteristic optic disc damage or typical visual field loss by Humphrey automated perimeter, disease onset before age 40 and exclusion of secondary causes of glaucoma.

Result: We examined 122 of 153 living members of this four-generation family. The pedigree chart commenced from the index patient's maternal grandmother (deceased) who had a history of a blinding eye disease at a young age. JOAG was found in 32 family members, including 11 who were newly diagnosed during the screening and showed characteristics of autosomal dominance. The mean age at diagnosis was 28.8 ± 8.8 yrs, with a mean IOP of 38.6 ± 13.3 mmHg. 12 eyes already had NLP. MYOC gene screening revealed non-synonymous polymorphism EX3 1440C > A Asn480Lys was in all but 2 affected members. 4 mutation carriers were glaucoma suspects (age range 9-31 yrs).

Conclusions: Asn480Lys mutations were found in this large Malay family with JOAG. The phenotype showed an early onset of the disease with an aggressive course if not treated. Therefore it is important to offer clinical and genetic screening of family members with JOAG to identify those who are undiagnosed and those at risk in order to initiate early treatment.

P24 THE NEW MYOC GEN MUTATION IN MALAY PRIMARY OPEN-ANGLE GLAUCOMA PATIENTS

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Background: Genetic factor is thought to be one of the determinant factors that affects the increased intra ocular pressure (IOP) or susceptibility of optical cell. The objective of the present study is to study the MYOC gene mutation in Malay POAG patients.

Methods: This study is an epidemiology genetic with case control design. The study was conducted at Cicendo Eye Hospital Bandung, Faculty of Medicine Padjadjaran Univer-

sity and Eijkman Institute Jakarta from June 2009 to May 2010. Study group was 13 POAG patients selected by consecutive sampling while control group was 15 normal individuals who do not have family relationship with the glaucomatous patients. Genetic analysis of MYOC gene was done using blood from both study and control groups.

Results: This study found glu86val and thre32iso MYOC mutations. There was no significant difference between study and control groups in glu86val ($p = 0.644$, OR:95% CI) and thre32iso ($p = 0.644$, OR : 95% CI) MYOC mutations.

Conclusion: There was a new MYOC mutation gene in Malay race.

General Aspects: Pathogenesis

P25 VASCULAR BIOMARKERS IN GLAUCOMATOUS AQUEOUS HUMOR

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Purpose: The Anterior Chamber from a biological point of view as a space surrounded by endothelium and path by a liquid should be considered a vessel. The endothelial leukocyte adhesion molecule-1 (ELAM-1), is the earliest marker of atherosclerotic plaque in the vasculature, and is activated in HTM cells collected from patients with glaucoma. The aim of this paper is to investigate the expression of others vascular biomarkers in the aqueous humor of patients with primary open angle glaucoma (POAG) and controls.

Methods: Aqueous humor proteome was analyzed by antibody micro-array from 20 patients. Ten patients with uncontrolled intraocular pressure despite maximal therapy undergoing filtering procedures and 10 patients undergoing senile cataract surgery. The expression of tested proteins was detected by protein Cy3/Cy5 labeling, column purification and hybridization on antibody-spotted glass micro-array. Fluorescent signals were detected by fluorescence laser scanning.

RESULTS: Aqueous humor levels of The vascular smooth muscle cell (VSMC) as well as of vasodilator-stimulated phosphoprotein (VASP) were significantly higher ($p < 0.01$) among POAG patients than controls; On the contrary Thrombospondin (TSP)-4 expression were significantly lower ($p < 0.01$) in both POAG patients and controls.

Conclusions: The TSP-4 is abundant in atherosclerotic lesions and in areas prone to development of lesions and may influence the recruitment of macrophages. In our sample TSP-4 has shown no increase perhaps because its presence is linked to external factors to homeostasis endothelial. The VSMC is a highly specialized cell whose principal function is contraction, thereby decreasing the diameter of a blood vessel to regulate the blood flow and pressure. The VASP is an important regulator of actin dynamics and stabilizes endothelial barriers through interaction with cell-cell contacts and focal adhesion sites. Our data support the hypothesis that a progressive accumulation of oxidative damage in the anterior chamber of the eye and specifically at the trabecular meshwork level occurs during glaucoma. The expression of these proteins in Aqueous humor of glaucomatous patients reflects

the damage that occurs in Trabecular meshwork endothelium and shows its functional decay which is clinically followed by IOP increase.

P26 REDUCTION OF ER STRESS ALLEVIATES GLAUCOMA SYMPTOMS IN A MOUSE MODEL OF MYOCILIN GLAUCOMA

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Background: Mutations in the gene Myocilin (MYOC) are a significant cause of juvenile glaucoma and contribute to the development of primary open angle glaucoma in some patients. To date, the mechanisms that lead to elevated intraocular pressure (IOP) as a result of MYOC mutations have not been fully elucidated. We recently developed a transgenic mouse model of MYOC-glaucoma to investigate the functional and biochemical consequences of MYOC mutations.

Methods: Transgenic mice were created expressing human MYOC with the pathogenic Y437H mutation under the control of the CMV promoter (Tg-MYOC^{-Y437H}). The development of elevated IOP and resultant glaucoma phenotypes was determined using non-invasive tonometry, optic nerve sections, retinal ganglion cell (RGC) counts, and pattern ERG (pERG) deficits. Proteomic and immunohistochemical approaches were used to demonstrate expression of endoplasmic reticulum (ER) stress molecules. Additionally, Ad5 vectors expressing either normal or Y437H MYOC were used to drive expression of these genes in cultured cells and in mouse eyes.

Results: Starting at approximately 3 months of age Tg-MYOC^{-Y437H} mice develop significantly elevated IOP when compared to wildtype (WT) littermates (20.3 mmHg vs. 14.1 mmHg). The development of elevated IOP results in progressive loss of RGC (18% loss at 5 months of age and 30% at 12 months) and optic nerve axons (38% at 12 months of age). Tg-MYOC^{-Y437H} mice also present a 63% reduction of pERG amplitudes at 12 months of age. Proteomic and immunohistochemical evaluation demonstrated increased expression of markers of the unfolded protein response (UPR) in the trabecular meshwork of Tg-MYOC-Y437H mice, including GRP78, and activated eIF2 alpha, ATF-6, IRE and XBP-1. Significantly, induction of UPR in normal mice, through intracameral injections of inhibitors of ER function, results in a statistically significant and dose dependent elevation of IOP. Conversely, oral administration of a chemical chaperone known to alleviate ER stress and UPR significantly reduces IOP and attenuates glaucoma phenotypes in Tg-MYOC^{-Y437H} mice.

Conclusion: Our data indicate that pharmaceutical reduction of UPR decreases IOP in Tg-MYOC^{-Y437H} mice suggesting that UPR activation is an essential component of the pathophysiology of myocilin mutations. Furthermore, ER stress and/or UPR are sufficient to induce elevated IOP, even in the absence of MYOC^{-Y437H}. ER stress in TM cells can result from numerous genetic and environmental challenges suggesting that this mechanism may also contribute to elevated IOP in POAG in some patients without MYOC mutations.

General Aspects: Quality of Life

P27 DIRECT QUANTIFICATION OF PHYSICAL ACTIVITY AND TRAVEL OUTSIDE THE HOME IN THE NORMAL DAILY LIVES OF GLAUCOMA PATIENTS

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Background: Visual field loss from glaucoma has been associated with worse balance, more falls, and worse self-reported mobility. However, the impact of visual field loss on mobility has not been directly quantified. Here, we describe the use of tracking devices to measure physical activity and the frequency of out-of-home travel in the daily lives of individuals with glaucoma.

Methods: Glaucoma patients with bilateral visual field loss and control subjects without significant visual field loss (as defined by standard automated perimetry) were recruited. All subjects were between 60 and 80 years of age. Physical activity over 1 week was monitored in terms of steps using a waistband accelerometer, and travel outside the home was monitored with a cellular network based tracking device. Differences in physical activity and out-of-home travel were evaluated in multivariable models incorporating demographic variables, co-morbid illness, the proportion of weekend days, and weather as covariates.

Results: Sixty-five glaucoma subjects and 37 controls were enrolled between July 2009 and November 2010. Subjects had an average of 6.8 days of valid accelerometer data and 6.3 days of valid tracking data. Glaucoma subjects did not differ from control subjects with regards to age, race, gender, employment status, or educational level ($p > 0.15$ for all). The median steps per day in control and glaucoma subjects were 5,510 (interquartile range [IQR] = 3,455-7,454) and 5,137 (IQR = 3,012-6,881) respectively. In multivariable models, visual field mean deviation (MD) was a significant predictor of daily steps taken, with a 5 decibel (dB) worsening in the better-eye field associated with a 12% reduction in daily steps ($p = 0.01$, 95% CI = 3-20%). Education (9% more steps per additional year, $p = 0.003$, 95% CI = 3-15%) and co-morbid illness (13% less steps per co-morbid illness, $p = 0.06$, 95% CI = -1 to 24%) were independent predictors of physical activity. Glaucoma subjects made fewer excursions outside the home per day than controls (median = 1.00 vs. 1.33; $p = 0.02$), and the percentage of person-days with no excursions outside the home was greater for glaucoma subjects than for control subjects (28.2% vs. 18.6%, $p = 0.007$). In multivariable models, glaucoma was associated with a greater likelihood of making an average of one or fewer daily excursions out of the home as compared to controls (OR = 3.5, $p = 0.01$, 95% CI = 1.3-9.3), and the odds of making one or fewer daily excursions out of the home increased 54% for every 5 dB worsening in the better-eye visual field MD ($p = 0.02$, 95% CI = 1.1-2.2).

Conclusions: Patients with glaucoma restrict physical activity to levels far below recommended guidelines and also limit travel outside the home. The substantial impact of glaucomatous visual field loss on mobility outcomes demonstrates the importance of vision-preserving treatments, and highlights the need for interventions to help maintain independence and adequate levels of physical activity.

P28 THE ASSOCIATION BETWEEN PRIMARY OPEN-ANGLE GLAUCOMA AND MOTOR VEHICLE COLLISIONS

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Background: Motor vehicle collisions (MVCs) are one of the most serious public health concerns in the world: estimates put the number killed in MVCs annually at 1-2 million, with a further 50 million injured, costing the global community about US\$518 billion. Information conveyed via the visual senses is the most relevant to a driver's assessment of the road situation at any given time, and proper visual function is essential for avoiding MVCs. Therefore, it is reasonable that many countries mandate a visual function examination of some sort for all driver's license applicants. The association between MVCs and glaucoma has been investigated in several preceding studies, but their conclusions are mixed. The aim of this study is to investigate and compare the incidence of motor vehicle collisions involving individuals with or without primary open-angle glaucoma (POAG).

Methods: A total of 265 subjects were consecutively enrolled: 121 (79 men, 42 women; age: 62.1 ± 8.0 years) with POAG; and 144 (95 men, 49 women; age: 61.2 ± 7.9 years) who were free of ocular disease. POAG was diagnosed on the basis of the presence of the following three findings: (1) glaucomatous optic cupping represented by notch formation, generalized enlargement of cupping, senile sclerotic disc or myopic disc, or nerve fiber layer defects; (2) typical glaucomatous visual field defects such as Bjerrum scotoma, nasal step, or paracentral scotoma compatible with optic disc appearance; and (3) open and not occludable angle observed on gonioscopy. Participants answered a questionnaire on MVC experience during the previous 10 years, past driving experience, and daily driving habits. The POAG group was subdivided into 3 groups according to disease severity (mild, moderate, or severe) to assess the relationship between POAG severity and MVC risk.

Results: A statistically significant association between POAG severity and MVC frequency was observed: 3.5% of the controls, 0.0% of the mild POAG group, 3.9% of the moderate POAG group, and 25.0% of the severe POAG group had experienced MVCs ($p = 0.007$, Cochran-Armitage trend test). The severe POAG group had experienced a much higher frequency of MVCs during the surveyed period than the control group ($p < 0.010$, Fisher's exact test). Logistic regression analyses to account for confounding factors (age, presence of diabetes mellitus, driving history, time spent driving per day, and best corrected visual acuity in the better or worse eye) produced consistent results.

Conclusions: Advanced POAG with marked visual field defects may be a risk factor for MVCs.

P29 VISION-RELATED QUALITY OF LIFE AND RETINAL NERVE FIBER LAYER PARAMETERS ASSESSED BY SPECTRAL DOMAIN OCT IN PATIENTS WITH GLAUCOMA

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Purpose: To assess the relationship between structural

alterations in the peripapillary retinal nerve fibre layer (RNFL) in patients with glaucoma and their functional impact on glaucoma specific health-related quality of life (hr-QoL).

Methods: Patients with glaucomatous optic neuropathy underwent the following examinations: spectral-domain optical coherence tomography (SD-OCT) of the peripapillary RNFL, standard automated perimetry (SAP), Goldman applanation intraocular pressure (IOP) and a complete ophthalmological examination. Glaucoma specific hr-QoL was assessed using the German version of the Glaucoma Quality of Life 15-item questionnaire (GQL-15). The relationship between functional and structural impairment was determined using a modified GQL-15 analysis (range 0 – 100), SAP parameters mean defect (MD) and pattern standard deviation (PSD), IOP and SD-OCT parameters for normality/borderline/abnormality from database deviations as well as total nerve fibre layer thickness for each sector.

Results: Forty-one patients were included. MD for the better eye was mean -3.70 ± 5.06 SD and -6.05 ± 5.04 for the worse eye. The logarithmic values of GQL-15 mean score (79.92 ± 16.86) showed significant correlations with the MD for the better eye (Spearman-Rho 0.408, $p = 0.013$). PSD was not correlated. One way ANOVA revealed a significant relationship between logGQL-15 and SD-OCT classification in the nasal sector of the better eye ($p = 0.035$, respectively) and between logGQL-15 and the OCT-classification in the temporal-inferior sector of the worse eye ($p = 0.009$). The other sectors or the global value/classification revealed no significance, neither did IOP or visual acuity.

Discussion: Patients with glaucoma report a reduced hr-QoL assessed with the GQL-15, that is correlated with the MD of the better eye. Structural parameters assessed by SD-OCT associated with diminished hr-QoL are the nasal sector of the better eye and the temporal inferior sector of the worse eye. The findings may help to understand, which regions of glaucomatous damage have most important influence in quality of life in patients with glaucoma.

P30 PREVALENCE OF ANXIETY AND DEPRESSION IN GLAUCOMA PATIENTS IN MEXICO

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There are data that suggest that emotional disturbances in glaucoma patients can affect their compliance with medication, for which reason the appropriate diagnosis of psychological stress can be very important in the treatment of glaucoma. The prevalence of anxiety and depression was studied in 400 patients at the Conde de Valenciana Institute's Glaucoma department. The Hospital Anxiety and Depression scale was used. Additional extra questions as to economy and co-morbidities were added. Anxiety was found in 26%, depression in 17% and both anxiety and depression in 12%, totaling 52% of patients with a positive test. The test also had positive correlations with poverty and insufficient funds for buying the required medicines. 36.25% of the patients spontaneously and specifically mentioned glaucoma as a cause of anxiety and stress. There was also a statistically significant correlation between anxiety and depression and the presence of economic difficulties, worse visual fields and poorer vision. We concluded that anxiety and depression are frequent in these patients, and that it is convenient to study this

area of mental health, to provide a better care for glaucoma patients.

P31 OCULAR SURFACE DISEASE AND QUALITY OF LIFE IN PATIENTS WITH GLAUCOMA

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Background: Ocular surface disease (OSD) is likely to be associated with poorer glaucoma-related quality-of-life (QoL). It may also be associated with glaucoma severity, and with specific medical or surgical therapies for glaucoma. We aim to investigate the relationship between ocular surface disease and glaucoma-related QoL, glaucoma severity and glaucoma treatment in patients with open-angle glaucoma (OAG).

Methods: A cross-sectional study was performed involving 124 patients with mild (n = 48), moderate (n = 34) or severe (n = 19) glaucoma and 23 controls who were ocular hypertensive or glaucoma suspects not receiving glaucoma treatment. Severity was stratified according to the Nelson Glaucoma Severity Scale (based on the degree of binocular visual field loss). Demographic information was collected via interviews; the Ocular Surface Disease Index (OSDI) and Glaucoma Quality of Life-15 (GQL-15) questionnaires were administered. Visual function was assessed by clinical examination and visual field testing. Group differences were evaluated using analysis of variance; for non-parametric data Kruskal-Wallis analysis of ranks was performed with significance set at $p < 0.05$. Age-adjustment of p-values was performed using analysis of covariance for parametric data and Kruskal-Wallis analysis on age-stratified non-parametric data. A univariate regression analysis modeled OSDI score to glaucoma severity, visual field indices, GQL-15 score, glaucoma surgery and the number and type of glaucoma medications. Age, gender and patient demographics were assessed for any correlation with OSDI score. Significant predictive variables were modeled in a multivariate regression analysis; the strength of correlation was assessed using parametric and non-parametric methods.

Results: OSDI scores and the number of patients with OSD increased with increasing glaucoma severity. ($p < 0.001$ and $p < 0.005$) Summary (and sub-factor) GQL-15 scores reflected decreased QoL with increasing glaucoma severity ($p < 0.001$). These trends were maintained after sub-stratification for age and gender. On univariate analysis OSDI was significantly correlated with GQL-15 summary score, glaucoma severity, multiple topical glaucoma medications, worse eye PSD and MD scores, use of topical beta blockers, topical carbonic anhydrase inhibitors and glaucoma filtration surgery. No treatment correlated with a low OSDI score. Age, gender, visual acuity and prostaglandin analogues did not correlate with OSDI score. On multivariate regression analysis GQL-15 summary score was predictive of OSDI score (odds ratio 4.14, 95% confidence interval 2.59 – 6.63, $p < 0.001$).

Conclusions: OSD is more common in patients with increasing glaucoma severity and is associated with poorer glaucoma-related QoL.

P32 VISUAL DISABILITY, QUALITY OF LIFE AND BURDEN OF CARE IN GLAUCOMA PATIENTS

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Background: Glaucoma has been found to be associated with significant psychological distress for several reasons i.e. due to psychological impact of diagnosis, inconvenience of treatment for the whole life, side effects and cost of treatment and damage to visual fields. This disability and loss of quality of life affects not only glaucoma patients but has potential to cause medical, social and financial difficulties to the whole family. Reduction in quality of life in glaucoma patients is well documented but data on disease burden caused by glaucoma on society or caregivers is scanty. It is more relevant in the developing world as family members are the main care givers in patients with all disabilities. This study was designed to study the quality of life and disability in patients with glaucoma and burden of disease on their families and to compare it with that in patients with cataract.

Methods: This study was an observational, prospective, cross-sectional study with single time assessment of each case. Participants consisted of persons more than 40 years of age recruited from glaucoma and lens clinic, from July 2008 to June 2009. Study included 100 glaucoma patients and 50 cataract patients as controls, who were group matched for age and sex. Inclusion criteria for glaucoma patients were diagnosed cases of primary open angle glaucoma, primary angle closure glaucoma, normal tension glaucoma or ocular hypertension, on regular follow up for atleast 3 years. Inclusion criteria for cataract patients as control were diagnosed unoperated cases of visually significant age related cataract. Exclusion criteria were presence of any organic disorder or cognitive impairment or current use of any medication due to a psychiatric disorder, co-existing ocular pathology, undergone ocular surgery except glaucoma surgery within the last 6 months, drug or alcohol dependent subjects. Patients were interviewed to obtain information on visual disability and vision-specific quality of life using National Eye Institute Visual Field Questionnaire-25 (NEIVFQ-25) and on general quality of life using WHO quality of life Brief Hindi version (WHOQOL-Bref). Burden of care of disease was assessed using Family Burden Interview Schedule. Outcome measures included scores of all three questionnaires.

Results: Scores for glaucoma were significantly lower than cataract in general vision, social function, mental health, role difficulties and dependency subscales in NEIVFQ-25 ($p < 0.05$). General quality of life scores were significantly poorer in glaucoma as compared to cataract patients in all domains of WHOQOL Bref including general well being, physical health, psychological, social relationship and environment ($p < 0.05$). There was more burden of care in families of glaucoma patients as compared to cataract patients in Family Burden Interview Schedule for all sub scales including financial burden, disruption of routine family activities, family leisure, family interaction, physical health, mental health ($p < 0.05$).

Conclusion: The general quality of life, visual disability and influence of limitation in visual functioning on health related quality of Life was significantly poor in glaucoma patients, and burden of care was significantly more in families of glaucoma patients as compared to that with cataract.

P33 QUALITY OF LIFE IN GLAUCOMA PATIENTS

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Background: Quality of life in glaucoma patients is clinically difficult to evaluate. The Glaucoma Quality of Life Questionnaire (GQL-15) is one of many questionnaires that have been developed to assess patients' visual disability relating to different tasks. Quality of the questionnaire can be evaluated through the degree of correlation with objective indices of disease stages in glaucoma.

Methods: 78 patients with the same stage of glaucoma in both eyes, visual acuity of at least 0.8 in each eye and no additional ocular disease were included in the study. According to the Hodapp classification 22 patients had early glaucomatous loss, 16 moderate glaucomatous loss and 22 advanced glaucomatous loss. 22 patients with ocular hypertension and no visual field loss served as control group. All patients completed a GQL-15, sent to their home by regular mail.

Results: The scores of GQL-15 showed a significant correlation with perimetric mean deviation (MD) values ($r = 0.42$, $p < 0.001$). There was a statistically significant difference in GQL-15 score between control group and patients of any stage of glaucoma. However, GQL-15 scores were not significantly different between patients of different glaucoma stages. Patients most often reported difficulties with adjusting to bright lights, going from light to dark room or vice versa, and adjusting to dim lights. Activities related to peripheral vision showed the highest degree of correlation with the glaucoma stage ($p < 0.001$).

Conclusions: Patients' visual disability relating to different activities, evaluated with the GQL-15, were significantly associated with objective indices of disease stages in glaucoma. The questionnaire provides a helpful tool in understanding patients' subjective perception of the disease and plays an important part in treating glaucoma patients.

P34 COMPARATIVE ANALYSIS OF VISION-RELATED QUALITY OF LIFE INDICATORS BY THREE QUESTIONNAIRES, IN PATIENTS WITH GLAUCOMA AND CONTROLS WITH CATARACT

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Background: The National Eye Institute Visual Function questionnaire (NEI VFQ), Visual activities questionnaire (VAQ), and the Indian Visual function questionnaire (Ind VFQ) are some of the questionnaires to assess VRQOL. There is a lack of publications on QOL of glaucoma patients in India and performance of VRQOL questionnaires in the Indian population with glaucoma.

Aims and Objectives: To assess the QOL using 3 questionnaires, namely, NEI VFQ 25, VAQ, Indian VFQ 33. To assess the relation of clinically measured indicators of vision loss with the overall scores and subscale scores.

Design of study: Prospective, comparative, clinic based observational study, in an urban setting.

Material and Methods: Inclusion Criteria – glaucoma patients with POAG, PACG, OHT. Controls – Normals and early Cataract (< LOCS grade II). Exclusion Criteria – Secondary glaucoma. Ocular Co-morbidities except Cataract. Patients who were unable to understand and answer the

questionnaires. Totally, 300 patients with Glaucoma, and 150 controls were enrolled in the study. 100 glaucoma patients, and 50 controls were administered each questionnaire (NEI VFQ25, VAQ, IND VFQ33). All participants underwent a complete Glaucoma evaluation including Humphrey Visual fields (30-2, Sita Standard). Random selection of questionnaire, and administered on consecutive patients by structured face to face Interviews, by two trained counselors outcome measures: BCVA, Visual Field Indices: MD, PSD, VFI, QOL scores from IVFQ, VAQ and VFQ. Statistical analysis: SPSS version 15.

Results: The characteristics of the three patient groups allocated to the three questionnaires were comparable in Age, Education, Employment, Insurance, Living situation, and Diagnosis (ANOVA and Chi square tests). Patients in the Glaucoma group were further divided into- no field loss, mild, moderate and severe based on extent of visual field loss (MD). All the eight subscales of the VAQ were significantly affected in patients with glaucoma, when compared to controls (Mann Whitney U $p = 0.001$). Among the 12 subscales of the NEI VFQ, General Health, General Vision, Mental Health, dependency, Driving and Peripheral Vision were significantly affected in patients with Glaucoma, when compared to controls ($p = 0.0001$, MW-U). There was no difference in the scores of three subscale groups of Indian VFQ, in Glaucoma patients compared to controls. VAQ, and NEI VFQ scores were poorer in those with lesser BCVA ($p = 0.003$, 0.004 , MW-U test). IVFQ scores failed to show any correlation with BCVA ($p = 0.065$, MW-U). MD, PSD and VFI correlated with VAQ and NEI VFQ scores. IVFQ showed no correlation with visual fields indices. VAQ and NEI VFQ scores correlated with severity of field loss (Kruskal Wallis test $p = 0.001$ – VAQ, $p = 0.055$ VFQ). IVFQ scores had no correlation with severity of visual fields loss ($p = 0.470$, K-W test). One eyed persons had poorer quality of life (VAQ, NEI VFQ).

Conclusion: VAQ, and NEI VFQ 25 perform well in differentiating QOL in patients with Glaucoma c/t controls, in our setting (Urban India). QOL scores correlate with clinical indicators of vision and severity of field loss. The Indian VFQ does not elicit the QOL difference between cases and controls and is not correlated with any clinical indicator of vision.

P35 ABSTRACT WITHDRAWN

P36 THE HIGH FREQUENCY AND DETERMINANTS OF REDUCED QUALITY OF LIFE AND THE EMOTIONAL IMPACT RELATED TO THE ANNOUNCEMENT OF THE DIAGNOSIS OF GLAUCOMA TO AFRICAN PATIENTS

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Background: The announcement of the diagnosis of glaucoma to patients is a complex task for doctors worldwide. Data on Quality of Life (QoL) and emotional disorders related to this chronic disease are available in developed countries but not in the African setting. The objective of the study was to investigate the impact of announcement of the diagnosis on changes in QoL and frequency of personality disorders

and to identify the determinants of reduced QoL in African glaucoma patients.

Methods: In this cross-sectional study, a research assistant conducted verbal interviews with glaucoma patients attending the Department of Ophthalmology, Kinshasa Teaching Hospital, DR Congo. The assessment included: demographic factors, personality patterns using Hamelin tools, QoL and visual capacity features in glaucoma using Viswanathan questionnaires. Ophthalmic assessment included visual acuity, automated tangent screen visual field testing, applanation tonometry, slit-lamp biomicroscopy, and gonioscopy.

Results: 67 patients with established POAG were interviewed and assessed. 83.6% were males and the mean age was 54.2 ± 16 years. The results of the interviews showed that there was a significant change in all factors assessed after the Ophthalmologist announced the diagnosis of glaucoma. 68.8% had shown anxiety/stress. 56.3% behavior disorders. 75% suffered a feeling of severe illness. 90.9% reported a reduced QoL, and 56.7% had the impression of a deterioration of Vision loss. Younger age < 60 years, visual field defects, Intraocular hypertension, and onset of symptoms to doctor presentation > 5 years were identified as the significant and independent determinants of reduced QoL.

Conclusion: Psychopathological considerations are important to the announcement of the diagnosis of glaucoma in Africa. This is particularly important given the epidemic level of glaucoma and the need to encourage patient understanding and compliance.

P37 STUDY OF CIRCADIAN ACTIVITY IN PATIENTS WITH ADVANCED GLAUCOMA

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Purpose: Glaucoma is a major cause of blindness characterized by progressive and irreversible damage of the optic nerve. Although the degenerative loss of retinal ganglion cells and visual deficit associated with glaucoma have been extensively studied, recent evidence suggest that glaucoma can also affected non-image-forming visual functions, such as the control of circadian rhythms. The aim of this study was to evaluate the circadian physiology, particularly sleep/wake cycles in patients with bilateral advanced glaucomatous neuropathy.

Methods: Nine normal control subjects from 55 to 80 years and nine age-matched patients with bilateral advanced primary open-angle glaucoma with more than 10 years from diagnosed, were included in this observational, prospective, case-control study. Advanced glaucoma damage was considered as a combination of both an optic nerve with a vertical cup to disc ratio of more than 0,8 and an altered visual field, defined as a mean deviation worse than -12 db. Subjects with neurologic and motor disorders or those who used common hypnotic drugs were excluded. The visual field analysis was performed with a Humphrey Field Analyzer II computer 750 and a core program 24-2. We included only reliable visual fields (fixation losses, false positives and false negatives below 25%) in phakic and pseudophakic patients.

Patients were required to record the timing and duration of their sleep and daily activities, and wore an actigraph (Micro-Mini Motionlogger® Actigraph, USA) on the wrist of the non-dominant arm for 20 days.

Results: Although no differences in total minutes scored as sleep were observed between groups, glaucomatous patients showed a significant decrease in the sleep efficiency and the percentage of sleep, whereas the amount of wake minutes and the mean wake episode duration after sleep onset were significantly higher on the glaucomatous patients than in the control group.

Conclusions: These results suggest circadian alterations, particularly in the sleep quality, in patients with advanced glaucoma.

P38 WHAT DOES THE WORLD LOOK LIKE TO PEOPLE WITH GLAUCOMA?

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Purpose: To understand how glaucoma affects vision and demonstrate this with illustrations.

Methods: 1) As part of a previous study (ADREV)*, one hundred individuals with varying stages of glaucoma were queried intensively and extensively to develop an understanding of what those individuals saw. 2) Modeling of visual loss was done based on what the world would presumably look like binocularly to individuals with glaucoma, considering the known effects of glaucoma on visual acuity, visual field, contrast sensitivity, dark adaptation and color perception.

Results: A consistent aspect of visual loss present in glaucoma is 'blurring' of vision. This does not appear to be a decrease in resolution similar to that occurring with macular change or optic neuritis, but rather a generalized loss of ability to see boundaries. Also commonly noted is a need for more light. 'Missing areas of field' are rarely noted by patients. Illustrations graphically demonstrating these changes have been developed. They do not resemble the classic illustrations intended to portray the nature of visual loss caused by glaucoma.

Conclusions: With the exception of those individuals who have bilateral end-stage glaucoma, the classic 'tunnel vision' concept of glaucomatous visual loss is faulty. This is not even particularly accurate for monocular patients. The most consistent aspects of visual loss are 1) generalized decrease in contrast sensitivity, more marked laterally (temporally), and 2) difficulty seeing in the dark. Illustrations graphically demonstrating these changes have been developed. They do not resemble the 'classic' illustrations intended to portray the nature of visual loss caused by glaucoma.

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General Aspects: Glaucomas as Cause of Blindness

P39 PREVALENCE OF LOW VISION FOR GLAUCOMA IN MEXICAN POPULATION

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Background: Glaucoma frequently can lead to severe visual loss and blindness if not taken care in time. The objective of this study, was to identify and quantify the main factor that limit visual function and participation in the activities of daily life, in order to plan optimal program for rehabilitation of low vision and blindness.

Methods: A sample of 171 patients at the Institute of Ophthalmology 'Conde de Valenciana' in Mexico City in November 2010, reported the loss of vision as a factor limiting their daily activities. We evaluated aspects such as: age, gender, social and demographic characteristics, morbidity, visual acuity (logMAR) and visual fields (MD in dB).

Results: The average age was 62.5 years, with 65.49% females and 34.5% males. The economic level is fair to good in 80.7 % and poor in 19.3% of cases. The 56.8% of the cases had systemic diseases such as diabetes mellitus in 21 %. The 72 % is the visual acuity was excellent, 0.1 logMAR or better, 22.8 % good (from 0.18 to 0.5 logMAR), 2.92% was moderate (0.6 to 0.88 logMAR) and 2.3% , was poor (1.0 to 1.3 logMAR). The visual fields according to the criteria presented by Hoddap and cols. was classified as mild in 52.84%, moderate damage in 18.69% and 28.45% had severe damage. When we examined the patients with good vision, we found 28.5% with severe visual field loss (worse than -12dB), and that patients with low vision had severe visual field loss in 100% of the cases.

Conclusions: We conclude that 5.26% of our patients had a significant visual acuity impairment, while 28.07% had a severe visual field loss. Therefore 33.33% of the total sample had low vision that can significantly limit daily activities. The economic level reported by patients in this group is favorable because it is anticipated that the 80.70% will be able to cover the primary costs of treatment and rehabilitation of disease. Rehabilitation is aimed at the recovery of visual skills based on recovery of peripheral visual field loss is not possible at this moment. In the case of significant central vision loss, optical aids including relocation prisms image can be used. Other options are non optical aids such as lighting, use of contrasts, white cane, and writing guides, electronic aids such as CCTV and vision therapy.

P40 RISK FACTORS AT DIAGNOSIS FOR BLINDNESS IN OPEN ANGLE GLAUCOMA

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Background: Determining risk factors at diagnosis for blind-

ness in glaucomatous eyes could help to identify patients who need to be followed more often and treated more aggressively in order to minimize blindness from glaucoma.

Methods: Retrospective study of all patients with primary open angle glaucoma and exfoliative glaucoma who died between January 2006 and June 2010, and had been followed at the glaucoma outpatient department at Skåne University Hospital, Malmö. We recorded the extent of visual field loss (MD in dB), IOP, presence of exfoliations, gender and age at the time of diagnosis. WHO criteria defined visual impairment and blindness. All eyes included in the study had to have automated perimetry (Humphrey or Competer) at baseline. Visual acuity or a visual field examination had to be available 3 years or later before the patient's death. We used uni- and multi-variate logistic regression to analyze association between baseline factors and glaucoma blindness. Median split was applied to determine odds ratio (OR) for IOP and MD at time of diagnosis.

Results: Six hundred and twenty-three glaucomatous eyes of 411 patients with mean age of 74.6 years (ranging from 46 to 96) where included in the analysis; 34 eyes, which were blind already at the time of diagnosis, were excluded from all analyses. Most patients had moderate visual field loss at time for diagnosis, median MD was 7.72 dB, ranging from -30.54 to +1.74). Baseline IOP ranged from 6 to 68 mmHg and the median was 24 mmHg. One hundred and seventy-three (27.8%) of all included eyes became blind from glaucoma. In univariate analysis higher baseline IOP, more baseline visual field loss and exfoliation were significant risk factors for blindness, but in multivariate analysis exfoliation was no longer significantly associated with blindness. The risk for eyes getting blind in glaucoma was approximately two and a half times higher in eyes with worse baseline MD (OR 2.56, 95% CI 1.7 – 3.75). It was nearly three times higher in eyes with worse baseline IOP (OR 2.86, 95% CI 1.96 – 4.15) Age at diagnosis and gender did not significantly influence the risk of blindness.

Conclusion: In this large group of glaucomatous eyes, a worse baseline visual field defect more than doubled and a higher baseline IOP nearly tripled the risk for blindness.

P41 INVESTIGATION OF FACTORS UNDERLYING MEDICATION NON-COMPLIANCE IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA: A QUALITATIVE STUDY

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Background: Glaucoma is a chronic condition requiring life-long medical treatment to lower intraocular pressure and prevent vision loss (Weinreb & Khaw, 2004). Even though hypotensive eye drops have proven to lower ocular pressures, approximately 59% of patients do not take their eye drops as prescribed (Schwartz, 2005). The aim of the current study was to investigate barriers to medication compliance in glaucoma patients, patients' perception of glaucoma and perceived risks associated with non-compliance.

Methods: Structured interviews were conducted with 33 glaucoma patients (Mean age = 68.8 years). The nVivo8 software was used to analyze the transcribed interviews in terms of frequency of constructs and to make associations between themes.

Results: Four unique themes were identified that were linked to non-compliance: Symptoms of glaucoma (e.g., asymptomatic condition); barriers to compliance (e.g., memory; health beliefs regarding eye drops); consequences of vision loss (e.g., inability to perform everyday tasks); and causes of glaucoma (e.g., hereditary, external environment). Overall, 20% of patients reported 100% compliance and 73.6% reported they would occasionally miss their eye drops 60% of patients reported awareness of the relationship between increased intra-ocular pressure and potential vision loss if medication is not taken.

Conclusions: Patients' self-reported experiences of their glaucoma and treatment regime provide insights to the underlying mechanisms of non-compliance. Such findings would assist healthcare professionals in communicating information of the risks associated with non-compliance to prescribed medication. This would potentially serve to motivate patients to follow treatment recommendations.

P42 SOS GLAUCOMA IN PARAGUAY

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Background: Glaucoma is the first cause of irreversible blindness. Early detection and proper treatment of the disease may avoid blindness. The present study is to evaluate the impact of glaucoma patients in Paraguay and determine glaucoma as a cause of blindness.

Methods: 4,081 records of patients with diagnosis of glaucoma at Fundacion Oftalmologica from 1999 to 2010 were retrospectively reviewed. visual acuity, IOP, optic nerve, visual fields, and success of medical treatment were evaluated.

Results: Bilateral blindness from glaucoma occurs in 2.52% of the patients. Monocular blindness occurs in 12.22%. IOP below 21 mmHg was noted in 71.43% of the cases and glaucomatous visual field was found in 71.03% of the patients. Optic disc cup ≥ 0.6 was record in 82.62% of the patients. Compliance of medical treatment was < than 50% in urban patients and < than 30% in rural areas, reaching 0% of compliance in deep rural areas.

Conclusions: Blindness from glaucoma occurs in at least 15% of patients with the diagnosis. IOP alone should not be used as unique criteria for glaucoma detection. Medical treatment failed in rural patients due to poor compliance. Laser surgery should be considered at first line therapy for some rural glaucoma patients.

General Aspects: Prevention and Screening

P43 THE EAST LONDON GLAUCOMA PREDICTION SCORE (ELGPS): WEB BASED VALIDATION OF GLAUCOMA RISK SCREENING TOOL

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Background: Early detection of glaucoma is highly desir-

able. It is difficult for optometrists and general practitioners to know which patients are at risk. The ELGPS is a web based risk calculator that has been developed to determine glaucoma risk at the time of screening. Multiple risk factors that are available in a low tech environment are assessed to provide a risk assessment. This is extremely useful in settings where access to specialist care is difficult. Use of the calculator is educational. It is a free web based service. Data capture is user specific.

Method: The scoring system is a web based questionnaire that captures and subsequently calculates the relative risk for the presence of glaucoma at the time of screening. Three categories of patient are described: Unlikely to have glaucoma; glaucoma-suspect and glaucoma. A case review methodology of patients with known diagnosis is employed to validate the calculator risk assessment.

Results: Data from the patient records of 400 patients with an established diagnosis has been captured and used to validate the screening tool. The website reports that the calculated diagnosis correlates with the actual diagnosis 82% of the time. Biostatistics analysis showed: Sensitivity = 88%; Positive predictive value = 97%; Specificity = 75%.

Conclusion: Analysis of the first 400 patients validates the web based screening tool as being a good method of screening for the at risk population. The validation is ongoing. The web based format will allow a more widespread recruitment for different geographic, population and personnel variables.

P44 A RESOURCE EFFICIENT SERVICE FOR EVALUATION OF PATIENTS WITH SUSPECTED GLAUCOMA

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Background: A large number of patients who are referred to ophthalmologic clinics or private practices under suspicion of glaucoma do not actually suffer from the manifest disease. Frequently it is a question of suspected glaucoma, due to ocular hypertension, glaucoma heredity etc. This group needs an effective service for evaluation and eventual follow up. This service should ideally optimise the use of technology and nurses, freeing physician resources to concentrate on the complex cases of manifest glaucoma.

Methods: Since early 2008, all patients under care at our hospital clinic for suspected, but not manifest glaucoma and all new patients referred to us by primary care physicians or opticians with high IOP or glaucoma heredity were initially seen by an ophthalmic nurse. The patients were questioned about glaucoma heredity, IOP was measured (GAT) and pachymetry performed. The presence of pseudoexfoliation and / or pigmentary changes was noted and the visual fields were checked by FDT (C 20-1). After pupil dilation 3D-OCT with fundus photography images were recorded. An experienced glaucoma specialist later evaluated all the information, decided on diagnosis, and informed the patient with one of five standard letters, including information on follow up.

Results: We have a pool of about 2300 patients under care at our glaucoma clinic. Approximately 250 new patients are referred by other health providers and opticians each year. 20% of existing and all of the referred patients have been redirected to this new type of evaluation service. Of these, 15% of existing and 20-30% of referred patients were judged to need no further specialist care after their first visit (and

redirected to opticians for future IOP measurements). This number increased after subsequent visits to the service. This has given more time to follow up patients with manifest glaucoma, with a consequent reduction in waiting lists. We believe that we have improved the quality of diagnosis in the group of patients where glaucoma has been suspected by combination of several diagnostic tests with high sensitivity and specificity and the evaluation of these by an experienced glaucoma specialist.

Conclusions: This type of service uses existing resources to provide a greater number of more qualified evaluations in a population of patients that consumes a large amount of healthcare. The glaucoma physician can evaluate a large number of patients solely from the results taken by the service's nurses. This reduces the waiting lists, but gives a greater number of patients access to the experience of a glaucoma specialist. The physician can then dedicate his time to those patients most in need of advanced care. As well as giving a high quality of care, the service is cost efficient.

P45 AGREEMENT BETWEEN INTRAOCULAR PRESSURE MEASUREMENTS BY NURSE PRACTITIONERS AND CONSULTANTS IN PATIENTS BEING ASSESSED FOR GLAUCOMA

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Background: Increasing rates of referral for glaucoma are necessitating a move away from the traditional ophthalmologist provided care pathway in the UK. Increasingly non medical practitioners such as nurse specialists are assessing patients for glaucoma. This study compares the intraocular pressure measurements obtained by nurse specialists with a specialist qualification in glaucoma with the current gold standard i.e. measurements obtained by a consultant with subspecialty training in glaucoma.

Method: 20 patients undergoing assessment for glaucoma had the intraocular pressure measured in one eye by both a nurse practitioner and a consultant ophthalmologist. Each assessor obtained 3 measurements and the mean was calculated. The examinations were performed within one hour of each other to reduce the influence of diurnal variations and both the nurse practitioner and consultant ophthalmologist were masked to the others findings. Agreement between the two examiners was assessed by calculating an interclass correlation coefficient.

Results: Comparing the 20 measurement sets the mean difference between recorded intraocular pressure was 1.18 mmHg. An interclass correlation coefficient was calculated to be 0.98 suggesting a strong degree of correlation between the two sets of measurements.

Conclusion: Trained nurse practitioners are able to make reliable assessments of intraocular pressure when assessing patients for glaucoma. The correlation compares favorably with previously reported results for community optometrists. This clinical skill can provide a valuable resource in the diagnosis and monitoring of patients with glaucoma

P46 A TELEMEDICINE MODEL TO PREVENT BLINDNESS FROM FAMILIAL GLAUCOMA

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Purpose: To develop, implement and evaluate a telemedicine model to reduce glaucoma blindness through early detection of undiagnosed glaucoma in high-risk individuals.

Methods: Individuals with known diagnosis of primary open angle glaucoma were invited to enroll their first-degree relatives (FDRs) to undergo an eye examination by a registered nurse trained to perform the examination. Clinical data were entered into a purpose-built database then graded off-site by an ophthalmologist to determine presence, absence or suspicion of glaucoma. Participants were notified the grading result and individually tailored recommended review. Newly diagnosed cases if glaucoma were referred for prompt treatment.

Results: 133 index glaucoma cases agreed to nominate FDRs for the study: 211 FDRs were available for examination. Whilst 5% of FDRs were already under treatment for glaucoma, an additional 5% of those examined were identified with undiagnosed glaucoma. 14% were graded as having suspicious signs of glaucoma with an additional 6% found to have ocular hypertension. For every 19 people screened in this cohort, one previously undiagnosed case of glaucoma was identified.

Conclusions: A telemedicine model is an efficient method for screening, grading and notifying participants of examination results. Nurses can be adequately trained to undertake the initial screening examinations, with grading of results performed offsite by a qualified ophthalmologist. This targeted screening increases the yield of identifying individuals with undiagnosed glaucoma or those at greatest risk of the disease. Time and cost efficiencies for this screening model should be further explored and implemented to prevent glaucoma blindness.

P47 PREVALENCE OF GLAUCOMA IN A POPULATION IN ALGERIAN SAHARA

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Background: To determine the prevalence of glaucoma in a population in Algerian Sahara (city of El Oued), with high percentage of melanoderm people and weak socio-economic condition.

Methods: A group of 938 patients were examined with the same protocol, which included: assessment of visual acuity (VA), applanation tonometry, gonioscopy and examination of the optic disc. Open angle glaucoma (OAG) was defined by the presence of the following signs : cup to disc ratio (C/D) of 0.4 or more, optic disc palor, optic disc hemorrhages, vertical cupping, nasal deviation of vessels, baring of circumlinear vessel; asymmetry of the size of the cups between the two eyes and ISNT rule modified. OAG was also defined by a high intraocular pressure (IOP) ≥ 22 mmHg. The diagnosis was made in blind eyes with raised IOP or previous glaucoma surgery.

Results: 938 patients were examined. We found a glaucoma prevalence of 9.2% in our transversal study. The sex ratio was 1.2, mean age was 59.3 (40-96 years). The prevalence increased in age in this population. We found 87 patients with

OAG (92.5%) and 7 patients with normal-pressure glaucoma (7.4%). 39 patients (44.8%) were known and treated as glaucomatous, and 48 patients (55.2%) have been diagnosed having OAG in our study. Risk factors associated with OAG were: diabetes 21.8% (n = 19), high blood-pressure 18.3% (n = 16), myopia 13.7% (n = 12) and family history of glaucoma 9.2% (n = 8). C/D ratio were ≥ 0.9 in 46.1% of known and treated glaucomatous patients, 16 % of diagnosed OAG. 50% of diagnosed OAG had an IOP between 21 and 24 mmHg, 37% between 24 ET 28 mmHg and 13% had an IOP ≥ 28 mmHg. 47.4% of treated glaucomatous had IOP ≤ 21 mmHg.

Conclusions: In spite of some bias in this study, the prevalence of open angle glaucoma seems to be very high in populations living in Algerian Sahara. Thus, it represents a major health care problem emphasizing the need for large scale screening of glaucoma campaigns; for early detection and prevention of blindness and visual impairment. Management of OAG by surgery should be the procedure of choice because of poor compliance when using eyedrops, and weak socioeconomic conditions which characterize these populations.

P48 EARLY DETECTION OF GLAUCOMA: GLAUCOMA WORLD DAY-SCREENING

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Aim: Glaucoma is usually symptomless and vision loss is irreversible. With early detection, medications and surgeries can be used to prevent further vision loss. World Glaucoma Day aims to educate people about how to assess their risk for glaucoma and to be aware of the importance of regular eye exams and disease detection.

Material and Methods: During the glaucoma screening program 108 persons were included. We took a database from patients and paid attention to all glaucoma risk factors (age, race, family history, diabetes, high myopia, hypertension, migraine, headache...). We measured IOP with applanation tonometry and checked head of optic nerve by ophthalmoscopy.

Results: Age – most of people were in age of 60-70. (46%), 56% with cardiovascular disease, 50% with hypertension, 17% with family history. Results of IOP: 16% were with IOP more than 21 mmHg. C/D ratio: 10% more than 0.4 and C/D asymmetry between two eyes more than 0.2, 2%. 21 of patients were suspicious on glaucoma and they were invited on complete glaucoma test on Eye Clinic. After all glaucoma diagnostics (visual acuity, CCT, applanation tonometry, gonioscopy Octopus perimetry, OCT), we detected 3 patients with open-angle glaucoma, one with low tension glaucoma and one with ocular hypertension.

Conclusion: Finding people with the early stages of glaucoma, and then treating them before they lose their sight is the key to prevention of blindness.

P49 A LOW VISION SCREENING IN ITALY PRELIMINARY REPORT

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Background: To find low vision persons needing a rehabilitation in the territory of the ASL Rm F of the Lazio Region, Italy.

Methods: The inhabitants of ASL Rm F aged 70-79 years with a self-reported visual loss were invited to participate in the screening. Low vision was classified according to WHO recommendations as follows: Visual Acuity (VA) of $< 3/10$ to $1/20$, uncorrected acuity or that provided by the corrective lenses normally used by the patient. The screening included 'thorough medical history, with particular reference to major diseases for high risk of low vision (glaucoma, pigmentary retinopathy, diabetes, high myopia, age macular degeneration), visual acuity (positive $\leq 3/10$), Amsler test tonometry: if positive (ocular pressure > 18 mmHg) a computerized visual field screening. Subjects screening positive, were invited to a complete ophthalmologic examination.

Results: The population in ASLRm F that were eligible for enrolment in our study numbered 5117. 1113 subjects participated in the screening (participation rate, 21,5%). There were 207 visual impairment cases. Only 160 received a complete ophthalmologic examination (participation rate, 77%). 29 cases were low vision (2.6% of the population screened). The remaining 131 cases had uncorrected or mis-corrected refractive errors. The causes of low vision were: 1. AMD (37%), 2. diabetic retinopathy (30%) 3. glaucoma (11%).

Conclusion: The low cost methodology has found a consistent number of persons with best corrected low vision who need rehabilitation. The prevalence of best corrected low vision may be underestimated because a group of 47 presenting visual impairment did not participated in final examination due to problems related to the lack of means of transport or the lack of persons who can accompany them. The glaucoma confirmed as third cause of low vision in a elderly population (70/79 years) who need visual rehabilitation.

P50 GLAUCOMA KNOWLEDGE AND EYE CARE UTILIZATION IN THE GENERAL COMMUNITY AND IN PATIENTS WITH GLAUCOMA

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Background: Glaucoma is one of the leading causes of irreversible vision loss in Australia. Although early detection and treatment are known to reduce the visual impact of this disease, a high rate of undiagnosed glaucoma suggests that eye care is underutilized by many in the Australian community. Patient education and awareness are key aims of support and advocacy groups, such as Glaucoma Australia, underpinning their philosophy that patients who are educated about their disease will lead to improved lives. This study aimed to examine the influence of knowledge about glaucoma on the utilization of eye care by those in the general community and by patients with glaucoma.

Methods: A telephone questionnaire was designed to survey randomly selected residents of the general community of New South Wales in Australia who were over 40 years of age. 500 respondents who had accessed eye care within 5 years ('Accessors') and 300 who had not ('Non-accessors') were surveyed, as well as 100 NSW residents with self-reported diagnosis of glaucoma. In addition, an identical questionnaire was posted to 2098 members of Glaucoma Australia who

had been diagnosed with glaucoma, 900 of whom completed the survey. The telephone interviews were conducted between November 2009 and February 2010 and the postal surveys were returned between February and July 2010. Participants were asked about their awareness of glaucoma, the need for regular eye care, the sources of their information about glaucoma and given a 10 question glaucoma knowledge quiz.

Results: Significantly more Accessors (96%) than Non-accessors (92%) in the general community reported having previously heard of Glaucoma ($p < 0.05$, Fisher's Exact test). Significant differences were evident between Accessors and Non-accessors in the perception of how often eye examination was required for those over 40 years of age ($p < 0.001$, Pearson Chi-square): the majority of Accessors considered an eye test to be necessary 'every 1-3 years', whereas non-Accessors considered 'every 5 years' to be equally acceptable. Accessors performed better than Non-accessors on the glaucoma knowledge quiz (average score Accessors $58 \pm 21\%$, Non-accessors $51 \pm 23\%$, $p < 0.001$ Independent samples t-test). In the glaucoma knowledge quiz, the Glaucoma Australia group appeared to outperform the general community and glaucoma patients in the general community (GA $76 \pm 20\%$, community glaucoma patients $70 \pm 20\%$). Whereas Accessors obtained their knowledge about glaucoma from family and friends and from their eye care practitioner, Non-accessors' primary source of information was television. The Glaucoma Australia patients obtained their information on glaucoma from their eye care practitioner or from Glaucoma Australia literature.

Conclusions: This study highlights a relationship between knowledge about glaucoma and utilisation of eyecare, implying that patient education plays a key role in preventing the impact of eye disease.

Anatomy and Physiology: Conjunctiva

P51 CONJUNCTIVAL EPITHELIAL THICKNESS IN PATIENTS TREATED FOR GLAUCOMA AND OCULAR HYPERTENSION

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Background: Although the long term use of IOP-lowering topical medications is associated with numerous changes of ocular surface tissues, the *in vivo* evaluation of these changes remains a challenge for clinicians. Spectral Domain OCT (SD-OCT) can provide images of the anterior segment and of ocular surface tissues. The aim of this study was to measure *in vivo* the bulbar conjunctival epithelial thickness in patients receiving anti-glaucoma topical treatments, in patients with dry eye syndrome and in healthy volunteers.

Methods: Fifteen patients treated for glaucoma or ocular hypertension (OHT) with IOP-lowering medications (group 1), 17 patients with dry eye (group 2) and 28 healthy volun-

teers (18 patients aged < 40 years (group 3) and 10 patients aged > 40 years (group 4)) were evaluated in that study. All patients had a complete ophthalmologic evaluation including Schirmer test, fluorescein staining and tear break-up time (BUT) measurement. A SD-OCT fitted with an anterior segment module (Spectralis OCT®, Heidelberg Engineering, Heidelberg) was used to measure the thickness of the bulbar conjunctival epithelium in the superior, inferior, nasal and temporal regions.

Results: The average thickness of conjunctival epithelium was $52.56 \pm 19.02 \mu\text{m}$, $51.06 \pm 22.36 \mu\text{m}$, $41.87 \pm 12.04 \mu\text{m}$ and $45.29 \pm 17.74 \mu\text{m}$, in groups 1, 2, 3 and 4, respectively. The conjunctival epithelium thickness was not statistically different between healthy volunteers aged < 40 years and > 40 years ($p = 0.473$). A significant increase of the bulbar conjunctival epithelium thickness was observed in patients treated with IOP-lowering medications and in patients with dry eye ($p = 0.044$ and $p = 0.014$ compared to healthy volunteers aged > 40 years (group 4) respectively).

Conclusion: Anterior-segment SD-OCT can provide a non-invasive evaluation of the conjunctival epithelium thickness *in vivo*. Conjunctival epithelial thickness was increased in patients treated with IOP-lowering medications and in dry eye.

Anatomy and Physiology: Cornea

P52 THE EFFECTS OF MAXIMUM AIR PULSE PRESSURE AND INTRAOCULAR PRESSURE ON CORNEAL HYSTERESIS MEASUREMENTS WITH THE REICHERT OCULAR RESPONSE ANALYZER

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Background: In the Reichert Ocular Response Analyzer (ORA), Pmax increases with increasing P1 (initially measured intraocular pressure (IOP)). In a previous study (Asaoka et al., ARVO 2008), in which different levels of shutdown pressures were used, we showed that the variation of maximum air pulse pressure (Pmax) may induce an artificial change in corneal hysteresis (CH) with the ORA, using custom software to control the level of shutdown pressure (and Pmax). The aim of this study was to re-evaluate the effect of Pmax on CH measurements in an independent data set of ORA measurements obtained with the commercially-available ORA machine.

Methods: ORA measurements and IOP measurements using Goldmann applanation tonometry (GATIOP) were performed on 41 healthy subjects and 35 ocular hypertensive patients before and after the administration of apraclonidine. In addition, central corneal thickness (CCT) was measured. Multilevel modeling (MLM) was used to analyse the relationship amongst the variables of interest, and bootstrapping was used to assess the significance.

Results: The regression formula suggested by MLM is: $\text{CH} = a \cdot \text{CCT} - b \cdot \text{GATIOP} - c \cdot \text{Pmax} - d \cdot \text{age}$, where $a = 0.40$ (95% Confidence Interval (CI) 0.20 to 0.52), $b = -0.39$ (CI -0.90 to -0.24), $c = -0.016$ (CI -0.13 to 0.57) and $d = -0.22$ (CI

-0.35 to -0.070); all variables were normalized by dividing [measured value – average of the variable] by the standard deviation of the variable. Furthermore, bootstrapping suggested that only CCT, GAT10P and age were significant ($p \leq 0.05$). Pmax was not significant ($p = 0.92$), which may be attributed to the non-skewed (normal) distribution of Pmax in this study, contrary to that in the previous study, and a masking effect of P1 (and GAT10P) on Pmax.

Conclusions: Overall, our results suggest that Pmax has a potential to induce an artificial change in CH, but in real-world clinical practice, the actual influence is very small and not significant.

Anatomy and Physiology: Anterior Chamber Angle

P53 COMPARISON OF THE SCLERAL SPUR VISIBILITY IN PRIMARY AND SECONDARY GAZES USING ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

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Background: Anterior Segment Optical Coherence Tomography (AS-OCT, Visante™; Carl Zeiss Meditec, Dublin, California) is a tool for anterior segment imaging of the eyes. Yet one of its limitations is poor visualization of upper and lower angles because of eyelid coverage. We introduced a new method for more visibility of the upper and lower angles by holding only upper eyelid when subjects looked downward for superior angle imaging, and vice versa for inferior angle. In addition, the image colors inversion tool for printed report may also enhance the sclera spur (SS) identification. To validate the new method and the benefits of image colors inversion, SS visibility was used to compare.

Methods: This cross-sectional observational study included ninety healthy subjects of any age. All participants underwent a complete eye examination, and AS-OCT imaging. Scleral spur was defined as the point where there was a change in curvature of the inner surface of angle wall, often appearing as an inward protrusion of sclera. The conventional and new methods were defined by imaging without lids manipulation and holding only upper eyelid whilst operated consecutively. Primary gaze was defined by normal eye position. Secondary gaze was defined by looking downward for superior angle imaging, and vice versa for the inferior angle. Scleral spur visibility at 90 and 270 degrees of the right eye was identified on AS-OCT images by one examiner (N.S.), and masked to other test results. The examiner tried to identify the SS on each normal and color inverting image. The SS visibility in each gaze of each eye was compared by McNemar chi-square tests. $p < 0.05$ was considered statistically significant.

Results: The mean age was 43.91 years (range, 17-77 years). Female (71.1%) was predominant.

Conclusions: With the current methods, overall SS identifications were low ($\leq 60\%$). On normal AS-OCT images, both 90 and 270 degree, secondary gaze did not improve the SS visibility. Colors inversion seems to be useful for SS visualization

in secondary gaze at 90 degree and primary gaze at 270 degree. The newer method to determine the SS such as automatic identification by the device may be another practical alternative.

P54 VISUALIZATION OF SCHLEMM'S CANAL BY ANTERIOR SEGMENT OCT IN EYES WITH OCCLUDABLE ANGLES

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Purpose: To evaluate the ability of the visualization of Schlemm's canal by swept-source anterior segment OCT and to elucidate the relationship between angle occludability and the visualization of Schlemm's canal.

Methods: Consecutive 60 eyes of 60 patients with occludable angle were studied. 39 subjects were with primary angle closure (PAC) or primary angle closure glaucoma (PACG) and 21 were with primary angle closure suspect (PACS). High resolution swept-source anterior segment OCT images in 4 quadrants were taken in the dark room condition by the masked observers. Visualization of the Schlemm's canal was judged by a masked glaucoma specialist.

Results: Schlemm's canal was observed more frequently in PACS group (24 eyes, 29%) than that in PAC/PACG group (26 eyes, 17%). ($p = 0.03$, chi-square test).

Conclusion: Schlemm's canal may be damaged more seriously in eyes with PAC/PACG than PACS.

Anatomy and Physiology: Meshwork, Schlemm's Canal, Collector System

P55 ENDOTHELIAL-LINED AQUEOUS CONDUITS SPAN SCHLEMM'S CANAL (SC) TO ATTACH TO COLLECTOR CHANNEL OSTIA: IDENTIFICATION BY 3D RECONSTRUCTION OF HISTOLOGIC SECTIONS

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Background: Transparent cylindrical tubes (about 2/mm around SC circumference) span between the trabecular meshwork and SC external wall. The tubes may represent normal conduits for aqueous flow but are difficult to study. The purpose of the current report is to describe new techniques to permit study of the transparent tubes. Visco-elastic dilation of SC provides a light path that permits use of new non-destructive techniques involving the dissecting microscope, phase contrast and Nomarski (differential interference microscopy) to image the tubes. Non-destructive imaging is unable to define tissue composition or relationships to collector channel ostia however. Therefore, structures identified by non-destructive techniques were identified in the same tissue by means of serial epon-embedded histologic sections. The sections were then stacked and processed to provide computer generated 3D projections.

Methods: Macaca nemestrina monkey eyes (16) to develop

techniques, Healon injection into SC in each quadrant, Kar-novsky fixative, 250-500 u radial limbal segments, 80-power dissecting microscope (41 segments, oblique light, black background), phase contrast (231 images in 30 segments), Nomarski 1-2 u sections (5,129 images in 33 segments), epon embedded 1 u histologic sections (356 serial sections in 1 segment), Photoshop for Z axis merge of histologic stacks, ImageJ for 3D projections.

Results: A radial 356 u radial segment of SC circumference containing 4 tubules was chosen for correlation of nonde-structive techniques with imaging from 1u histologic sections. Findings: (Dissecting Microscope) 4 white structures arose from SC inner wall as a funnel, developing into a cylindrical structure that then attached to SC external wall; (Phase Con-tract) 4 semitransparent structures with comparable dimen-sions, position and topography; (Nomarski) 4 structures arising from SC inner wall. An optically empty funnel-shaped area continuous with the juxtacanalicular space was also continuous with the lumen of an optically empty cylinder that spanned SC; (Histologic Sections) Tubular structures initially identified by nondestructive techniques arose from SC endo-thelium in a funnel shape that developed into endothelial-lined cylindrical structures with a lumen that traversed SC to attach to SC external wall; two tubes attached between and two at the entrance of collector channel ostia. Dissecting microscope, phase contrast and Nomarski images from other segments had an appearance like the segment selected for histologic sections.

Conclusions: Transparent cylindrical tubes identified by non-destructive imaging approaches using the dissecting microscope, phase contrast and Nomarski could be corre-lated with histologic sections. Computer generated projec-tions of histologic sections demonstrated tubes composed of endothelium that had a lumen communicating with the aque-ous-filled juxtacanalicular space ensuring aqueous access to the lumen. Projections of the entire SC region were rotated 360 degrees simultaneously in the X and Y-axis to study relationships between the tubes and SC walls. The tube lumen transitioned from a funnel to a cylindrical shape and traversed SC to attach at collector channel ostia. The tube characteristics suggest they may act as conduits selectively transporting aqueous from the juxtacanalicular space across SC to collector channel ostia.

Anatomy and Physiology: Aqueous Humor Dynamics, Production, Composition

P56 SERINE/THREONINE AND TYROSINE PHOSPHATASES ARE ACTIVE IN CATARACT AND GLAUCOMA AQUEOUS HUMOR AND CORRELATE WITH ITS REDOX STATE

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Background: Direct and proteomics analysis of aqueous humor (AH) in the last years revealed the presence of many signaling proteins. Additionally, changes in the AH antioxi-

dant capacity was found in cataract and glaucoma in humans AH. In our laboratory we were able to show that several mem-bers of the Mitogen Activated Protein Kinases are presented in the AH of rats and are subjected to changes depending on the intraocular pressure. In the present study, phosphatases activity was analyzed in human AH samples taken from cataract and glaucoma patients.

Aim: (1) To analyze and compare the activity of serine/ threonine phosphatases and tyrosine phosphatases (PTP) in cataract and glaucoma AH samples. (2) To evaluate the tested AH sample redox state. (3) To look for correlation between the redox state and the phosphatase. activity.

Patients / Methods: AH samples were taken from 118 patients suffering from Cataract \pm exfoliation only (n = 89) or with Glaucoma \pm exfoliation (n = 29). Medical backgrounds were recorded. The AH samples were tested for different phosphatases presence and activity (Promega V2460 & V2471). AH total antioxidant capabilities (FRAP & ORAC), superoxide dismutase activity and glutathione content were evaluated.

Results: Two Serine/Threonine phosphatases, PPase2A and PPase2C and PTP were detected in part the AH of cat-aract and glaucoma patients. The tested phosphatase mean levels did not differ between the groups. However significant differences were found among the percentage of negative/ positive in the PTP assay among Cataract versus Glaucoma (p = 0.0122), Cataract + exfoliation versus Glaucoma + exfo-liation in PPase2A (p = 0.0172) and PTP (p = 0.0902). There was no effect of the patient age, sex and medical maladies background. In all the tested AH samples from the different groups similar Redox state were found. Positive correlation were found between PPase2A and PPase2C (Pearson 0.368), PTP and the antioxidant assay-FRAP (Pearson 0.362).

Conclusions: Different phosphatases can be detected in cataract and glaucoma patients' aqueous humor. The inci-dence of the tested phosphatases presence among the dif-ferent maladies, vary. These phosphatases target proteins who are obscure for moment, might serve as new local target for intervention in glaucoma and cataract.

P57 NITRIC OXIDE UP-REGULATES CONNEXIN43 EXPRESSION IN ISOLATED HUMAN CILIARY PROCESSES

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Purpose: To investigate the effect of nitric oxide (NO) on the expression of connexin43 in the human ciliary processes. The involvement of cyclic GMP (cGMP)-protein kinase G (PKG) pathway in the effect of NO on connexin43 (Cx43) expression was also tested.

Methods: Immunohistochemistry staining of Cx43 was per-formed in isolated human ocular anterior segments. In the presence or absence of guanylyl cyclase inhibitor ODQ (100 μ m) or PKG inhibitor KT5823 (10 μ m), isolated human ciliary processes were incubated either with NO donor sodium nitro-prusside (SNP, (100 μ m) or cGMP analogue 8-Bromo-cGMP (10 μ m). The protein expression of Cx43 was determined by Western Blot method.

Results: Immunoreactivity of Cx43 was detected mainly along the apical cytoplasmic junction of the pigment epithe-lium and the non-pigmented epithelium in the human ciliary

processes. SNP increased Cx43 protein expression, an effect that could be inhibited by either ODQ or KT5823. 8-Bromo-cGMP also increased Cx43 protein expression and this effect was inhibited only by KT5823.

Conclusions: Through activation of guanylyl cyclase-cGMP-PKG pathway, NO up-regulates Cx43 expression in human ciliary processes. These results suggest the involvement of NO-cGMP-PKG pathway in the intercellular communication, and possibly the process of aqueous humor formation in human eyes.

P58 DAY AND NIGHT CHANGES IN IOP AND AQUEOUS HUMOR DYNAMICS OF PATIENTS WITH OCULAR HYPERTENSION TREATED WITH THREE GLAUCOMA DRUGS

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Background: Questions have arisen concerning the nighttime intraocular pressure (IOP) lowering efficacy of glaucoma drugs and their effects on aqueous humor dynamics. This study compares the 24 hour changes in aqueous humor dynamics of one outflow and two inflow glaucoma drugs in patients with ocular hypertension.

Methods: This is a double-masked crossover nine visit study of 30 volunteers with ocular hypertension. The day and night differences in aqueous humor dynamics were determined at baseline (washout) and following two weeks of treatment with latanoprost, timolol and dorzolamide in a randomized crossover design with a 6 week washout between drugs. Day and night assessments were made of aqueous flow (Fa, $\mu\text{L}/\text{min}$) by fluorophotometry, outflow facility by tonography (Cton, $\mu\text{L}/\text{min}/\text{mmHg}$), and central cornea thickness (CCT, μm) by pachymetry. Uveoscleral outflow (Fu) was calculated by the Goldmann equation. IOPs (mmHg) were made by pneumatometry with the subject in a seated position during the day (9AM and 11AM) and both seated and supine positions at night (10PM, midnight, 2AM). Comparisons among the drugs were made by repeated measures ANOVA and day and night comparisons were made by two-tailed, paired t-tests.

Results: At baseline, significant nighttime compared to daytime changes were reductions in seated IOP, aqueous flow and uveoscleral outflow and increases in CCT and habitual IOP (seated IOP during the day and supine at night, $p < 0.05$). Latanoprost reduced IOP by 18% during the day by increasing uveoscleral outflow three-fold. At night latanoprost reduced IOP by 12% but the doubling of uveoscleral outflow did not reach statistical significance. Timolol reduced IOP during the day by 17% which was caused by a 25% decrease in aqueous flow. Timolol had no effect on IOP and aqueous humor dynamics at night. However timolol reduced IOP at 9 am, 12 hours after the previous dose. Dorzolamide reduced IOP during the day by 16% which was caused by a 16% decrease in aqueous flow. Dorzolamide had no effect on IOP and aqueous humor dynamics at night or at 9AM. No drug altered CCT.

Conclusions: The daytime IOP effects of timolol and dorzolamide are mediated by aqueous humor suppression and for latanoprost by uveoscleral outflow stimulation. Aqueous humor suppression is an ineffective means of lowering IOP at night because of the natural reduction in nocturnal aqueous flow. The finding that IOP is reduced by timolol at 9AM

suggests that timolol blocks the normal aqueous flow rise in the morning. Uveoscleral outflow stimulation reduces IOP at night but normal physiological reductions in uveoscleral outflow limit the nighttime IOP effect.

Anatomy and Physiology: Trabecular Outflow

P59 DIMINISHED PROTEOLYTIC ACTIVITY AND ACCUMULATION OF PROTEASOMAL AGGREGATES IN THE GLAUCOMATOUS TRABECULAR MESHWORK

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Background: To investigate the pathogenetic state of open-angle glaucoma. In particular the effects of altered intra- and extracellular trabecular meshwork enzyme quantity and activity.

Methods: Trabecular meshwork (TM) specimen from 16 patients with POAG were collected during trabeculectomy surgery and flash frozen at -80°C . Control TM tissue was obtained from the scleral rim of corneal transplant donors. The donors were age and gender matched but not affected with glaucoma. Proteins were isolated using established procedures and subjected to Western Blot analysis, mass spectrometry and enzymatic activity assays. This research was conducted in compliance with the tenets of the declaration of Helsinki.

Results: Increased quantities of TM calpain and cathepsin D were noted in immunoreactivity assays. However, the proteolytic activities of both were markedly reduced compared to control TM. Excessive amounts of proteasomal aggregates were seen in glaucomatous TM.

Conclusions: Our results support a role of oxidative protein damage in the etiology of POAG. Modified, inactive calpain-1 may accumulate as proteasomal aggregate in the trabecular meshwork of patients with glaucoma. Reduced enzymatic activity of both calpain-1 and the lysosomal protease cathepsin D and accumulation of inactive proteases as proteasomal aggregates may contribute in the pathophysiology of POAG by affecting TM outflow resistance.

P60 THE EFFECTS OF RHO/ROCK ACTIVATION IN DEXAMETHASONE-INDUCED INCREASE OF AQUEOUS-OUTFLOW RESISTANCE

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Background: Dexamethasone, a widely used glucocorticoid, was reported to alter the actin cytoskeleton of trabecular meshwork (TM) and to increase extracellular-matrix deposition in aqueous-outflow tissues. These effects were speculated to relate to ocular hypertension, a serious side effect of glucocorticoid therapy. However, the mechanisms of these effects were not clarified thoroughly. We examined whether the RhoA/Rho kinase (ROCK) pathway is involved in one of

the mechanism of dexamethasone-induced ocular hypertension.

Methods: The effect of dexamethasone on the RhoA activation was evaluated by pull-down assay in porcine trabecular meshwork (PTM) cells. The effects of a ROCK inhibitor (Y-27632) and dexamethasone on the transendothelial electrical resistance (TER) were measured to evaluate barrier integrity of the monolayer of monkey Schlemm's canal endothelial (MSC) cells. Y-27632-induced changes in outflow facility were measured in perfused porcine anterior organ cultures treated with 100 nM dexamethasone for 7 days.

Results: Relative RhoA activities were 1.45 ± 0.35 -fold increased 5 minutes after stimulation with 100 nM dexamethasone in PTM cells. TER of the MSC-cell monolayer was increased by 100 nM dexamethasone for 3 days (183 ± 4.6 ohms/cm²) compared with control (145 ± 1.4 ohms/cm²), which was reversed to background level by Y-27632. Perfusion with 100 nM of dexamethasone decreased outflow facility by $31.9 \pm 14.3\%$ compared with control at 24 hours, and this effect was sustained for 10 days. Combined treatment with dexamethasone and Y-27632 did not change outflow facility compared with vehicle treated control at 24 hours after drug perfusion.

Conclusions: The mechanism of dexamethasone-induced ocular hypertension was suggested to involve activation of the Rho/ROCK pathway.

P61 LAPLACE'S LAW APPLIED TO THE HYDRODYNAMICS OF AQUEOUS HUMOR

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Background: Laplace law linking the hydrodynamics of aqueous humor. The role of aqueous humor, is to maintain the anterior chamber without collapse. For it, physically, we would have to relate changes in surface tension of the aqueous, with online forces due to molecular effects.

Method: Virtually propose to the trabecular meshwork, as the real active player on the drainage of aqueous humor, the study of adrenergic agonists, muscarinic agonists, beta-blockers and prostaglandins, acting on the α -smooth muscle actin trabecular.

Results: The contraction of smooth muscle, decreases the diameter of microtubules causing increased capillarity and increased tensions on the surface.

Conclusion: The application of Laplace law in a hemispherical morphology as anterior chamber would originate on the surface tensions that could justify the uveoscleral pathway and the evacuation of aqueous humor in general by the phenomenon

Anatomy and Physiology: Uveoscleral Outflow and Lymphatics

P62 THE MORPHOLOGY OF UVEOSCLERAL OUTFLOW PATHWAY

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Purpose: To specify the uveoscleral outflow pathway.

Methods: India ink perfusion of anterior chamber and suprachoroidal space of human cadaver eyes through clear corneal and scleral tunnels, followed by lamellar scleral microdissection with subsequent histological examination.

Results: Subsequent microdissection demonstrated unexpectedly voluminous outflow through ciliary muscle and scleral paravasal spaces. No unintended damage of the anterior chamber structures or choroid (the possible cause of the outflow observed) was found. Histological research revealed numerous ink particles in the trabecular meshwork and between the ciliary muscle bundles. The ink particles go from the anterior chamber to the Schlemm's canal and particularly retain at the scleral spur. The main stream goes along the trabecular beams, bypass the scleral spur and flows into the ciliary muscle. Most of the trabecular shapes appears to continue directly into the ciliary muscle bundles. No ink particles were found in other structures of anterior chamber.

Conclusion: Aqueous drainage from the anterior chamber appears to be entirely trabecular with two components: trans-trabecular (usually considered as the conventional or trabecular outflow) and para-trabecular ('uveoscleral' outflow). Sufficient pathway for uveoscleral outflow may be represented by inter-trabecular slits continued directly into the spaces between the ciliary muscle bundles. The other structures of the anterior segment of the eye appear to play no substantial role in the aqueous outflow. Histological research revealed morphologically determined structures comprising four parts of uveoscleral outflow pathway, namely, trabecular meshwork, ciliary muscle spaces, suprachoroidal space, transscleral paravasal spaces. Involvement of ciliary muscle and its volume capacity suggests close interaction of eye hydrodynamics and accommodation.

P63 CIRCADIAN VARIATION OF AQUEOUS HUMOR DYNAMICS: EFFECTS ON EPISCLERAL VENOUS PRESSURE AND UVEOSCLERAL OUTFLOW

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Purpose: Aqueous humor flow decreases during sleep, while IOP in the physiologic positions (sitting during day; supine at night) increases. Previous work suggests that outflow facility decreases slightly at night, but not enough to explain this pattern. However, the contribution of episcleral venous pressure (EVP) and uveoscleral outflow to the nocturnal change in IOP are unknown, due of the lack of objective methods to measure EVP. In this study we used a new method to assess circadian changes in EVP, and combined with measurements of aqueous humor flow and IOP, we examined circadian changes in uveoscleral outflow.

Methods: Twenty-six eyes of 13 healthy subjects (age 47-76; mean 59 years) were studied in the mid-diurnal and mid-nocturnal periods. IOP was measured by pneumatonometry, aqueous humor flow rate was determined by fluorophotometry, and outflow facility was measured by Shiotz tonography. EVP was measured by using a custom computerized venomanometer that applies an inflatable chamber to an episcleral vein and objectively determines the pressure required to collapse the vein. Uveoscleral outflow was calculated by using the modified Goldmann equation. IOP (sitting and supine), aqueous humor flow rate, outflow facility, EVP, and uveoscleral outflow rate during the day were compared to the same

parameters at night by using paired t-tests. **Results:** At night, aqueous humor flow rate decreased by almost 50%, sitting IOP was slightly lower, and supine IOP was unchanged. EVP was not different at night than during the day, but outflow facility and uveoscleral outflow both decreased significantly at night.

Conclusions: Decreased aqueous humor flow at night is compensated by decreased outflow facility and uveoscleral flow to maintain a high IOP. EVP remains unchanged, which suggests active regulation. The lack of uveoscleral outflow at night is consistent with the concept of a uveolymphatic drainage system that is pressure-insensitive, but dependent on eye movements.

P64 DIFFERENCES IN THE DRAINAGE OF 3KDA AND 40KDA TRACER FROM ANTERIOR CHAMBER AQUEOUS HUMOR REVEALED BY 2-PHOTON SCANNING LASER MICROSCOPY

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Purpose: To evaluate the outflow routes of smaller aqueous macromolecules from the anterior chamber, the kinetics of the intraocular distribution of different sized labeled dextrans were compared following intracameral injection.

Methods: Anesthetized adult albino (SD) rats received monocular intracameral injection of lysine fixable 3 kDa dextran-Cascade Blue or 40 kDa dextran-Texas Red. After 5-40 minutes, the eyes were enucleated and immersed in fresh formaldehyde. Whole eyes were examined by 2-photon scanning laser microscopy. Stacks containing 600 images were collected at the limbus spanning from inside the sclera through the depth of the uveal tract. These stacks were assembled into rotating 3-dimensional reconstructions of tracer distribution within tissues near the angle that included Schlemm's canal, iris, and the ciliary body.

Results: During the first 10 minutes after injection, substantial 40kDa dextran remained in the anterior chamber and appeared as a cloud near the anterior angle. A discontinuous tubular structure at the base of the angle likely corresponded to Schlemm's canal. Below this tubular structure, 40 kDa dextran appeared as many small clouds throughout the ciliary body that frequently anastomosed into highly branched networks. At 20 and 40 minutes, the amount of anterior chamber 40 kDa tracer diminished while the amount in the ciliary body increased. In contrast, by 5 minutes post injection, only occasional small flecks of 3 kDa dextran remained in the otherwise clear anterior chamber. However, substantial 3kDa dextran was present inside and adjacent to crenate radial blood vessels in the iris. Relatively straight columns of 3 kDa dextran also appeared in ciliary body along side occasional tubules likely to be blood vessels. The intensity of these labeling patterns were markedly diminished by 10 minutes post injection and were largely absent by 20 minutes post injection.

Conclusions: These results confirm that the outflow route of 3 kDa macromolecules in aqueous humor differs from 40 kDa macromolecules. Moreover, they suggest that 3 kDa macromolecules exit in part via iris blood vessels.

Anatomy and Physiology: Iris and Ciliary Body

P65 IRIS DYNAMIC CHANGES IN CHRONIC ANGLE CLOSURE AND PRIMARY ANGLE-CLOSURE SUSPECTS

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Background: We previously demonstrated, through histologic study on iris specimen, that the chronic angle closure eyes had less elasticity and iris dynamics. In this study, using anterior segment OCT, we attempt to document the changes of iris anatomy in response to dark and light conditions in chronic primary angle closure eyes (CPAC) and primary angle-closure suspects (PACS).

Methods: Subjects from the screening program of the Zhongshan Angle Closure Prophylaxis Trial identified as PACS and CPAC were enrolled in the study. Anterior segment optical coherence tomography was used to collect one horizontal scan image in dark and light condition. All images were analyzed with the Zhongshan Angle Assessment Program (ZAAP) software. Iris thickness at 750 microns to scleral spur (IT750), cumulative iris area (IA) and iris volume (IV) were chosen to present the iris characteristics and the pupil diameter was also measured. One randomly selected eye was chosen for bilateral PACS and the eye with more extended PAS was chosen for CPAC cases.

Result: A total of 940 participants (940 eyes, 816 PACS eyes and 124 CPAC eyes) with valid ASOCT measurements were included in the analysis. From dark to light, pupil size became smaller (-1.61 ± 0.99 mm) and this change was less apparent but not statistically significant in CPAC (-1.50 mm in CPAC and -1.63 mm in PACS, $p = 0.417$), whereas the iris became thinner (IT750, -0.053 ± 0.092 mm) and less change in CPAC (-0.052 in CPAC and -0.059 in PACS), iris cross-sectional area increased (0.284 ± 0.167 mm²) and less change in CPAC (0.261 in CPAC and 0.287 in PACS); iris volume also increased (2.000 ± 4.738 mm³) and CPAC had less changes (1.850 in CPAC and 2.022 in PACS).

Conclusion: From dark to light, the iris became thinner but the iris cross-sectional area and iris volume increase. The changes are less apparent in CPAC eyes although not statistically significant.

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Anatomy and Physiology: Choroid, Peripapillary Choroid, Peripapillary Atrophy

P66 RELATIONSHIP BETWEEN PROGRESSION OF VISUAL FIELD DAMAGE AND CHOROIDAL THICKNESS IN EYES WITH NORMAL-TENSION GLAUCOMA

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Background: Yin et al. have previously shown that generalized choroidal thinning is associated with vessel loss, and that it predominantly occurs in the inner choroids. After documentation of the original anatomical findings of peripapillary chorioretinal atrophy, many authors speculated that the ciliary circulation, particularly the choroidal supply to the papillary area, could be an etiological factor in glaucoma. Subsequent histological and fluorescein angiographic studies have supported this theory. The purpose of this study was to measure choroidal thickness in normal eyes and in patients with normal-tension glaucoma (NTG) using enhanced depth imaging (EDI) optical coherence tomography (OCT) and evaluate the association between choroidal thickness and progression of visual field damage.

Methods: A total of 62 eyes of 62 normal subjects and 45 eyes of 45 NTG patients were examined. The choroidal thickness was measured in images obtained by positioning a spectral-domain OCT. The choroid was measured from the outer border of the retinal pigment epithelium to the inner scleral border at the fovea and 3 mm nasal and temporal from the fovea. In the separate study, both eyes of the patients with NTG were included in the analyses. Visual fields were measured with automated perimetry. Changes in mean deviation (MD) per year (dB/year), that is, MD slope, were calculated.

Results: Compared to normal subjects, the choroidal thickness was significantly thinner in eyes with NTG at the fovea ($p = 0.045$) and at 3 mm nasal from the fovea ($p = 0.038$). Standard visual field testing was performed more than five times each in 61 eyes of 32 patients with NTG. There was a significant correlation between the choroidal thickness at 3 mm nasal from the fovea and the MD slope (Pearson $r = 0.424$; $p < 0.01$).

Conclusion: The decrease in the thickness of the choroid at 3 mm nasal from the fovea in eyes with NTG may be associated with progressive visual field loss. Thus, choroidal abnormalities may play a role in the pathogenesis of NTG.

Anatomy and Physiology: Peripapillary Retina and Choroid

P67 MYOPIC PERIPAPILLARY SINKHOLE: PROGRESSIVE RETINAL NERVE FIBER LAYER HERNIATION, HEMORRHAGE AND HOLE FORMATION CAUSE PERIPAPILLARY DETACHMENT

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Background: The authors observed the striking disappearance of retinal vessels into an unknown peripapillary potential space in three patients with myopic conus. Over time, two of the patients developed a gradually enlarging round atrophic retinal hole within the prolapsed retina, adjacent disc hemorrhages, glaucoma suspect status, superonasal field defects and peripapillary detachment. With the advent of spectral domain OCT, the authors were better able to delineate the anatomy associated with the striking disappearance of retinal vessels into this hollow or peripapillary sinkhole.

Methods: We identified three patients with a peripapillary hollow and associated findings of retinal herniation into the sinkhole, multiple disc hemorrhages, visual field loss and development of a focal hole in the retina with a surrounding RPE detachment. The clinical history was correlated with spectral OCT3 findings and stereo photographic disc analysis.

Results: Two of the three patients have extended follow-up with photographic documentation of prolapse of retinal tissue into a peripapillary hollow. The third patient has limited follow-up. All three patients were found to have a hole in the peripapillary retinal nerve fiber layer, one associated with multiple peripapillary disc hemorrhages. The 3-D analyses of the peripapillary tissues revealed an inferotemporal depression or sinkhole in the peripapillary myopic conus region. All patients were glaucoma suspects. Visual field defects were localized to the superonasal quadrants. All patients had an inferior RPE detachment. A communication from the floor of the sinkhole to the RPE was noted.

Conclusion: Due to the loss of retinal pigment epithelium and choroid in the conus along with underlying ectatic sclera that creates a potential space; the retinal nerve fiber layer has no support and gradually prolapses into the preformed depression. This peripapillary depression acts as a sinkhole for retinal tissue to herniate, infarct due to mechanical trauma and develop a hole that allows the escape of liquid vitreous under the peripapillary RPE. Thus what has the appearance of an acquired peripapillary pit is more complicated as evidenced by the chance long-term observation of a series of events termed peripapillary sinkhole.

Anatomy and Physiology: Retina and Retinal Nerve Fibre Layer

P68 THE ASSOCIATION BETWEEN RETINAL VESSELS AND RETINAL NERVE FIBER LAYER DEFECT IN MONO-OCULAR NORMAL-TENSION GLAUCOMA PATIENTS

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Background: To evaluate the association between retinal vessel diameter and retinal nerve fiber layer (RNFL) thickness in patients with normal-tension glaucoma (NTG).

Methods: This study included 84 previously untreated patients with mono-ocular NTG. A detailed eye examination including red free photo, stereo disc photo, Humphrey visual field, and measurement of RNFL thickness with stratus OCT was performed in all subjects. RNFL thickness, retinal artery and vein diameter, artery/vein ratio were compared between quadrants with or without RNFL defects using Zeiss Visupac program and Zeiss AV ratio.

Results: The mean retinal arteriolar ($p = 0.02$) diameters were significantly smaller in the quadrant with RNFL defects than without RNFL defect. Arteriovenular (AV) ratio was smaller in the quadrant with RNFL defects than without RNFL defect. The same correlation was produced when quadrant

was divided to superior and inferior. However, there was no significant correlation between the arteriolar diameter and venular diameter in the quadrant with or without RNFL defect ($p = 0.653$, $p = 0.651$, respectively).

Conclusions: The quadrants with RNFL defect had smaller diameters of the retinal arteriole than the quadrant without RNFL defects. Arteriolar diameter was significantly associated with RNFL thickness in the patients with NTG. Our results suggest that narrower retinal artery associate with poor blood supply which may lead RNFL defects.

P69 RETINAL NEVER FIBER LAYER THICKNESS IN CHRONIC RENAL FAILURE: ANALYSIS BY OPTICAL COHERENCE TOMOGRAPHY

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Background: Several ophthalmological changes have been described in patients with Chronic kidney disease (CKD), such as decreased tear output, calcium deposits in the cornea, cataract, glaucoma, retinal changes, and optic neuropathy. Dialysis toxicity, ischemia (due to anemia, hypotension, and generalized atherosclerosis) and uremia-associated systemic disorders are believed to play a role in the pathogenesis of optic neuropathy. Optical coherence tomography (OCT) is a high-resolution, noninvasive, non-contact diagnostic technique that permits assessment of several relevant aspects, including changes in reflectivity secondary to inflammatory infiltrates, atrophy, and fibrosis of the neurosensory retina, of the retinal pigment epithelium–choriocapillaris complex, and of the vitreoretinal interface, and also provides a tool for analysis of the retinal nerve fiber layer. The hypothesis that CKD and its treatment with dialysis could induce changes in the retinal microvasculature, leading to ischemia and RNFL damage, provides the rationale for this study. The objective of this study was to analyze the retinal nerve fiber layer thickness (RNFLT) in CKD patients by means of optical coherence tomography, ascertaining mean overall RNFLT and mean RNFLT in the nasal, temporal, superior, and inferior quadrants and comparing these measurements to those obtained from a control group.

Methods: This was a prospective, analytical, cross-sectional case-control study. The study sample comprised 11 chronic kidney disease patients with a history of at least 1 year of hemodialysis (6 male [21%] and 5 female [18%]; mean age, 48 ± 16.9 years) and 17 healthy controls (7 male [25%] and 10 female [36%]; mean age, 51.4 ± 19.3 years). All participants underwent a comprehensive eye examination, which consisted of uncorrected high-contrast visual acuity testing with an ETDRS™ chart (Lighthouse Inc., New York, NY); thorough biomicroscopy; measurement of intraocular pressure with a Goldmann tonometer (Haag-Streit, Bern, Switzerland); and funduscopy (including assessment of the optic disc and peripapillary nerve fiber layer) with a Volk 90D lens (Volk Optical Inc., Cleveland, OH). RNFLT was measured with a model 3000 OCT unit (Stratus OCT-3™, Carl Zeiss Meditec Inc., Dublin, CA). The fast RNFL protocol was used, which consists of three consecutive 3.4-mm-diameter circular scans centered on the optic nerve. Measured parameters included overall mean RNFLT and mean RNFLT at the tem-

poral ($316\text{--}45^\circ$), superior ($46\text{--}135^\circ$), nasal ($136\text{--}225^\circ$), and inferior ($226\text{--}315^\circ$) quadrants. The Mann-Whitney U was employed to assess possible between-group differences in mean overall RNFLT and RNFLT at the superior, temporal, nasal, and inferior quadrants. The null hypothesis was rejected when p -values were smaller than the set significance level of <0.05 . The study project was approved by the Hospital das Clínicas da UFPE Research Ethics Committee. All participants provided informed consent prior to inclusion in the sample.

Results and Conclusion: Twenty-two and 33 eyes were assessed in the case and control groups respectively. Mean RNFLT overall and at the superior, nasal, and inferior quadrants was greater in the control group, and that no significant between-group differences were detected in RNFLT at the temporal quadrant. Figure 1 provides a clearer visualization of these measurements.

P70 EXPRESSION OF STAT3 AND MMP-9 IN RAT RETINA FOLLOWING ACUTE HIGH INTRAOCULAR PRESSURE

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Background: To investigate the expression of STAT3 and MMP-9 in rat retina following acute high intraocular pressure (HIOP).

Methods: The models of acute ocular hypertension were made by perfusing 0.9% normal saline into anterior chambers of rat's eyes. After 60 minutes of ischemia and varied reperfusion time (6 hours, 12 hours, 24 hours, 48 hours, 72 hours), the rat eyes were enucleated. The level of p-STAT3 and MMP-9 in retina were by immunohistochemistry and analyzed by computer-picture analytic system.

Results: Weak signals for p-STAT3 and MMP-9 were observed in the normal group. p-STAT3 positive expression was detected at RIR 6 hours, peaked at 12 hours, then dropped gradually afterwards. MMP-9 positive expression was detected at RIR 6 hours, peaked at 24 hours, then dropped gradually afterwards.

Conclusion: p-STAT3 and MMP-9 was involved in the pathological in the retinal after transaction of acute high intraocular pressure.

P71 MITOCHONDRIAL DECAY AND IMPAIRMENT OF ANTIOXIDANT DEFENSES IN AGING RETINAL PIGMENT EPITHELIAL CELLS; RELEVANCE TO AGE-RELATED MACULAR DEGENERATION

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Purpose: Dysfunction of the mitochondria and cellular antioxidant systems are linked to aging and neurodegenerative diseases. In the eye, the retinal pigment epithelium (RPE) is exposed to a highly oxidative environment, partly due to elevated oxygen partial pressure from the choriocapillaris and to digestion of polyunsaturated fatty acid laden photore-

ceptor outer segments. Here we examined changes in the mitochondria (mt) of human RPE cells and sensitivity of the cells to oxidative stress with increased chronological age.

Methods: RPE cells from donor ages 9, 52, 62, and 76 were grown to confluency and the mt examined by electron microscopy and Mitotracker red fluorescent labeling. Susceptibility of RPE cells to H_2O_2 toxicity was determined by PI staining and LDH assay. ROS, cytoplasmic Ca^{2+} [Ca^{2+}]_c, and mt Ca^{2+} [Ca^{2+}]_m levels were measured by flow cytometry using H_2 -DCF-DA, fluo-3/AM and Rhod-2/AM, respectively, ATP levels by a luciferin/luciferase-based assay, and mt membrane potential ($\Delta\Psi$ m) by JC-1 fluorescence.

Results: RPE cells show greater sensitivity to oxidative stress and have alterations in mitochondrial number, size, shape, matrix density, cristae architecture, and membrane integrity as a function of age. Lower levels of ATP (~30%), ROS (~3.2 fold) and [Ca^{2+}]_c (~1.5 fold), decreased $\Delta\Psi$ m (~1.5 fold), and increased sequestration of [Ca^{2+}]_m (~2.3 fold) are observed in RPE cells from 76 yo when compared to 9 yo donors. There is decreased expression of the antioxidant genes mtHsp70, UCP2, and SOD3 but elevated SOD2 mRNA levels with increased aging. There were no significant changes in the release of cytochrome c or expression of the anti-apoptotic genes, Bcl2 and Bax in any of the primary cultures.

Conclusions: Our study provides evidence for mitochondrial decay, bioenergetic deficiency, and dysfunctional antioxidant defenses in RPE cells with advanced aging. With increased severity, these conditions may reduce important apical and basal RPE functions in the retina and promote the progression of retinal diseases such as age related macular degeneration.

P72 RETINAL NERVE FIBER LAYER THICKNESS IN HIGHLY MYOPIC EYE USING OPTICAL COHERENCE TOMOGRAPHY WITH MAGNIFICATION ADJUSTMENT

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Background: To measure the retinal nerve fiber layer (RNFL) thickness measurements in highly myopic eyes using optical coherence tomography (OCT) with magnification adjustment.

Methods: This cross-sectional study analyzed one randomly chosen eye in each subject (70 highly myopic individuals and 70 non-highly myopic individuals) using OCT by one experienced operator and comparisons of measurements between highly myopic eyes and control eyes were performed.

Results: Average global and temporal RNFL thickness measurements were significantly thicker in highly myopic eyes than those in control eyes ($p < 0.05$), and average superior ($p = 0.177$) and inferior ($p = 0.103$) RNFL thickness measurements were no significant differences between two groups of eyes.

Conclusion: Mean RNFL thickness measurement is thicker in highly myopic eye than those in control eye.

P73 A NEUROPROTECTIVE MOLECULE FOR RETINAL GANGLION CELLS IN DIFFERENT CELLULAR AND ANIMAL MODELS OF GLAUCOMA

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Background: Glaucoma, the second cause of blindness worldwide, is a retinopathy characterized by retinal ganglion cells (RGC) degeneration. Current treatments aim at reducing the increase in intra-ocular pressure (IOP) occurred in most glaucoma, whereas no drug targeting neuroprotection is available. To isolate, neuroprotective molecules, we have screened a library on pure adult rat retinal ganglion cells. One protective small molecule, an amino-acid (IDV007), was then validated on NMDA-treated retinal explants, DBA/2J mice and rats with episcleral vein occlusion.

Methods: Pure RGC from adult rat retinas were cultured for 6 DIV with or without the amino-acid (IDV007) and survival was assessed by calcein-positive RGC counting.

Retinal explants were cultured for 4 DIV, while excitotoxicity was induced by application of NMDA (100 μ M) during all time of culture. Explants were treated or not (Control) with the amino-acid, IDV007 (1mM). After cultures, explants were fixed and Brn-3a-immunopositive RGC density was evaluated on whole-mounts by automatic counting.

8-month old DBA/2J mice and rats with episcleral vein occlusion both present an increase in intra-ocular pressure. They were treated orally by IDV007 solution (0.2M) for 4 months and 3 months, respectively. The IOP was measured every month during the treatment. At the end of the treatment, electroretinograms were monitored in anesthetized rats. Finally, RGC density was quantified following Brn-3a-immunolabeling on dorso-ventral retinal cryosections.

Results: IDV007 treatment (1mM) promoted the survival (+69%) of cultured adult rat RGCs. In addition, freshly purified RGC was found to express selective transporter of this amino-acid (IDV007-t) and interestingly we showed that selective blockade of this transporter abolished the IDV007 protective action on pure RGC in culture. In addition IDV007 application (1mM) significantly rescued the RGC loss (+22%) in NMDA-treated retinal explants. IDV007 oral administration in both cauterized rats or in DBA/2J mice did not modify the elevated IOP. Interestingly, the treatment led to significant recovery of RGC density (+16%) in DBA/2J mice. In rats with episcleral vein occlusion, the treatment significantly prevented the decrease in the photopic ERG and the loss of RGC density, both induced by the cauterization.

Conclusions: These data indicated that treatments with the amino-acid IDV007 can stimulate RGC survival in different pathological conditions: deprived in vitro conditions, NMDA-induced excitotoxicity and in vivo increased intraocular pressure. Future studies are investigating further this new mechanism of RGC neuroprotection.

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Anatomy and Physiology: Optic Disc

P74 A CASE WITH CONGENITAL PIT OF THE OPTIC NERVE HEAD SHOWING INCREASED OPTIC NERVE FIBER DEFECTS WITH VISUAL FIELD DEFECT

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Background: A congenital pit of the optic nerve head (CPONH), a crater-like hole in the optic disc, is known to be associated with serous retinal detachment, optic nerve fiber layer defect or visual field defect. The associated nerve fiber layer and visual field defects are believed not to change after birth, unless serous retinal detachment develops.

Methods: This is a case report of CPONH without retinal detachment showing the development of optic nerve loss with associated visual field defect in a 54-year-old female.

Results: The patient had 2 pits (one temporal and the other inferotemporal) in the right eye, and at least the temporal one was considered to be CPONH, because the associated nerve fiber layer defect expanded to both the upper and lower sides of the horizontal line. During the 3 year follow-up period, both nerve fiber layer and visual field defects associated with the pits developed. The visual acuity in the right eye decreased. During the 3 years, optic disc excavations corresponding to the widening nerve fiber layer defects advanced, although the pits did not seem to change. The intraocular pressure was always measured to be under 18 mmHg during the follow-up period.

Conclusion: Optic nerve fiber layer defect with a corresponding visual field defect associated with CPONH can progress

P75 SIZE OF THE OPTIC NERVE HEAD IN MYOPIC EYES

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Background: There have been divergent opinions on the relationship between the size of disc and the degree of myopia. Authors designed this study to investigate the size of optic nerve head according to the refractive status and axial length.

Methods: The axial length and spherical equivalent were collected after measurement of optic nerve head parameters using spectral domain optical coherence tomography from 504 eyes of healthy volunteers. The correlation and the linear regression analysis were performed to investigate the relationship between the myopia and the size of optic nerve head.

Results: The disc area (mm²) and refractive error (D) had positive correlation ($r = 0.243$, $R^2 = 0.059$, $B = 1.399$). The disc area and axial length (mm) showed negative correlation ($r = 0.27$, $R^2 = 0.073$, $B = -0.089$). The disc area (mm²) and rim area (mm²) had strong positive correlation ($r = 0.44$, $R^2 = 0.193$, $B = 0.286$). The mean retinal nerve fiber layer (RNFL) thickness (μm) had significant correlation with spherical equivalent ($r = 0.346$, $R^2 = 0.119$, $B = 1.325$), axial length ($r = 0.265$, $R^2 = .068$, $B = -1.921$), disc area ($r = 0.374$, $R^2 = 0.14$, $B = 8.144$) and rim area ($r = 0.441$, $R^2 = 0.194$, $B = 14.771$).

Conclusions: The size of optic nerve head was smaller and the RNFL thickness was thinner in longer and more myopic eye.

P76 THE COMPARISON OF OPTIC DISC FINDINGS BY DIGITAL FUNDUS CAMERA AND INDIRECT FUNDUS EXAMINATION

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Background: To evaluate the optic disc findings accuracy with stereoscopic images of digital fundus camera (KOWA) by comparing with indirect fundus examination using 90° fundus lenses

Method: Fundus images of randomized 21 patients (37 eyes) were taken by a technician. Two glaucoma specialist contributed the study. The cup to disc ratio was determined with fundus camera and indirect fundus examination with 90° fundus lenses double-blinded by two physicians.

Results: The mean age was 57.02 ± 10.31 (25-72). The gender; male/female ratio: 7/14, (33.7/66.7%). The mean cup to disc ratios were 0.43 ± 0.13 and 0.40 ± 0.18 with digital fundus camera and indirect fundus examination respectively ($p \leq 0.01$). Although the statistical difference was significant between stereoscopic images and fundus exam rates, it is acceptable for clinical practice.

Conclusion: Fundus photography is a valuable clinical data to follow the patients for glaucoma progression. Digital stereoscopic images can be stored and re-evaluated by the following physicians.

P77 HISTOLOGY OF THE PARAPAPILLARY REGION IN HIGH MYOPIA

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Purpose: To examine histomorphometrically the parapapillary region in highly myopic human eyes.

Methods: The histomorphometric study included a highly myopic glaucomatous group (36 human globes; axial length > 26.5 mm), and a non-highly myopic group ($n = 45$; axial length ≤ 26.5 mm) divided into 28 globes enucleated due to secondary angle-closure glaucoma and 17 eyes enucleated because of malignant choroidal melanoma. Using light-microscopy, anterior-posterior histological sections running through the center of the pupil and the optic nerve were histomorphometrically assessed.

Results: The length of the scleral flange (distance between optic nerve border and dura mater of optic nerve) increased significantly with axial length ($p < 0.001$; correlation coefficient $r = 0.70$) and decreased with its thickness ($p < 0.001$; $r = 0.75$). Scleral flange length and thickness were not correlated with presence of glaucoma ($p = 0.55$ and $p = 71$, respectively). The scleral flange length was significantly associated with the distance between the optic nerve border and the beginning of Bruch's membrane ($p < 0.001$; $r = 0.83$), the beginning of the retinal pigment epithelium ($p < 0.001$; $r = 0.78$), the beginning of the retinal photoreceptors ($p < 0.001$; $r = 0.75$), and the beginning of the choriocapillaris ($p < 0.001$; $r = 0.90$). In all highly myopic eyes ($n=15$) with a distance between optic nerve border and beginning of Bruch's mem-

brane of > 0.5 mm, the peripapillary region consisted of an elongation of the peripapillary scleral flange associated with a thinning of the scleral flange and an extension of the retrobulbar cerebrospinal fluid space into the retro-parapapillary region. The peripapillary retina was composed of retinal nerve fiber layer (or its remnants) only, without elements of any other retinal layer, without peripapillary Bruch's membrane or choroid. This histological feature was not detected in any of the non-highly myopic eyes.

Conclusions: In axially highly myopic eyes, the peripapillary region consists of an elongated and markedly thinned peripapillary scleral flange associated with an extended retrobulbar cerebrospinal fluid space and missing choroid, Bruch's membrane and retina except of the retinal nerve fiber layer. This anatomical feature in axially highly myopic eyes may be of importance of the physiology and pathophysiology of the optic nerve head.

P78 COMPARISON OF OPTIC NERVE HEAD MEASUREMENT USING SPECTRAL DOMAIN OCT AND HRT

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Objective: To compare the performance of ONH measured by spectral domain OCT with those by HRT-III in normal people and glaucoma patients.

Methods: Eighty eyes of 80 eligible subjects (49 patients with glaucoma and age matched 31 healthy control subjects) were included in this cross-sectional study. All subjects underwent complete ophthalmic evaluation including best-refracted visual acuity, applanation tonometry, slit-lamp biomicroscopy, Humphrey SITA standard 30-2 visual field testing, dilated stereoscopic examination, fundus photography, optical coherence tomography (Cirrus HD-OCT; software ver.5.0; Carl Zeiss Meditec, Inc.) and Heidelberg Retinal Tomography (Heidelberg Retinal Tomograph; software version 3.0; Heidelberg Engineering GmbH, Heidelberg, German). A series of three good-quality scans were obtained by OCT and HRT-III for each eye.

Results: In the glaucoma patients group, the mean RNFL thickness, rim area(RA), disc area (DA), linear C/D, vertical C/D and cup volume (CV) obtained by SD-OCT were $74.31 \pm 13.02 \mu\text{m}$, $1.08 \pm 0.09 \text{ mm}^2$, $2.16 \pm 0.52 \text{ mm}^2$, 0.74 ± 0.16 , 0.72 ± 0.19 , $0.58 \pm 0.42 \text{ mm}^3$, respectively; the mean RNFL thickness, RA, DA, linear C/D, vertical C/D and CV obtained by HRT-III were 0.19 ± 0.11 , $0.80 \pm 0.06 \text{ mm}^2$, $2.12 \pm 0.43 \text{ mm}^2$, 0.64 ± 0.27 , 0.60 ± 0.29 , $0.50 \pm 0.61 \text{ mm}^3$. In the control group the mean RNFL thickness, RA, DA, linear C/D, vertical C/D and CV obtained by SD-OCT were $97.25 \pm 7.69 \mu\text{m}$, $1.40 \pm 0.26 \text{ mm}^2$, $1.8 \pm 0.38 \text{ mm}^2$, 0.45 ± 0.15 , 0.41 ± 0.16 , and $0.12 \pm 0.13 \text{ mm}^3$, respectively; the mean RNFL thickness, RA, DA, linear C/D, vertical C/D and CV obtained by HRT-III were 0.37 ± 0.08 , $1.52 \pm 0.29 \text{ mm}^2$, $1.7 \pm 0.45 \text{ mm}^2$, 0.15 ± 0.13 , 0.24 ± 0.19 , and $0.05 \pm 0.08 \text{ mm}^3$, respectively. No significant difference was found in DA measured by OCT and HRT in both glaucoma group and control group ($p = 0.46$, 0.46). The RA obtained by OCT were smaller than HRT in both glaucoma group and control group ($p = 0.00$, 0.03). However, the linear C/D and vertical C/D obtained by OCT were significantly larger than HRT in both glaucoma group and control group ($p = 0.00$, 0.00 , 0.00 , 0.00). CV obtained by OCT was deeper than HRT in control group ($p = 0.00$), but similar in

glaucoma group ($p = 0.03$). In glaucoma group, all of the parameters measured by OCT were positive correlated with HRT. In control group, except for RNFL, the other parameters measured by OCT were positive correlated with HRT. All of the parameters above were significantly different between glaucoma patients and control subjects both measured by OCT and HRT. The areas under ROC curve were 0.937 (RNFL), 0.895(RA), 0.692 (DA), 0.924 (linear C/D), 0.898 (vertical C/D) and 0.861 (CV) measured by OCT as compared with 0.903 (RNFL), 0.695 (RA), 0.782 (DA), 0.838 (linear C/D), 0.828 (vertical C/D) and 0.837 (CV) measured by HRT-III.

Conclusion: Parameters measured by spectral domain OCT can not interchange directly with that of HRT-III. Though the absolute value were different between the two equipments, both spectral domain OCT and HRT-III have capability to detect glaucoma from normal people. RNFL and linear C/D obtained by OCT and RNFL measured by HRT have the largest AUC (ROC).

Anatomy and Physiology: Optic Nerve

P79 INTEROCULAR COMPARISON OF THE PRELAMINAR NEURAL TISSUE AND THE LAMINA CRIBROSA THICKNESS IN HEALTHY EYES

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Background: The purpose of the study was to investigate the interocular difference in the thicknesses of the prelaminar neural tissue and the lamina cribrosa measured by spectral domain optical coherence tomography (SD-OCT) optic nerve head imaging in normal subjects.

Methods: A hundred and seventy six optic discs of 88 normal subjects were scanned using enhanced depth imaging SD-OCT. The thicknesses of the prelaminar neural tissue and the lamina cribrosa were measured on B scan images obtained at the center of the optic nerve head. The prelaminar and lamina cribrosa thicknesses for right and left eyes were compared.

Results: The mean age was 48.2 ± 13.6 years. Thirty one subjects were male and 57 were female. The mean prelaminar tissue thickness was $118.72 \pm 81.61 \mu\text{m}$, and the mean lamina cribrosa thickness was $232.54 \pm 61.35 \mu\text{m}$. There were no significant differences between right and left eyes both in the prelaminar thickness ($118.21 \pm 81.30 \mu\text{m}$ vs. $119.22 \pm 82.38 \mu\text{m}$, $p = 0.881$) and in the lamina cribrosa thickness ($233.81 \pm 64.54 \mu\text{m}$ vs. $231.27 \pm 58.34 \mu\text{m}$, $p = 0.720$). The 95% confidence limits on the differences between the two eyes ranged from -14.36 to $12.33 \mu\text{m}$ for the prelaminar neural tissue thickness and from -11.49 to $16.57 \mu\text{m}$ for the lamina cribrosa thickness.

Conclusions: A difference of more than approximately 12 to 14 μm for the prelaminar neural tissue thickness and 11 to 17 μm for the lamina cribrosa thickness is likely to exceed the physiologic difference between the fellow eyes, and may represent optic nerve head tissue damage.

Anatomy and Physiology: Chiasma and Retrochiasmal Central Nervous System

P80 CNS REGENERATION AFTER CHRONIC INJURY USING A SELF-ASSEMBLED NANO-MATERIAL AND MANGANESE-ENHANCED MRI FOR REAL-TIME IN-VIVO MONITORING

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Introduction: To speed up the process of central nervous system (CNS) recovery after injury, the need for real-time measurement of axon regeneration in-vivo is essential to assess the extent of injury, as well as the optimal timing and delivery of therapeutics and rehabilitation. It was necessary to develop a chronic animal model with an in-vivo measurement technique to provide a real-time monitoring and feedback system.

Method: We created this model using the hamster visual system for several reasons: since the visual pathway is near the surface of the brain it is easily observable by magnetic resonance imaging (MRI) and is accessible to make a controlled disconnection syndrome. In addition, it allowed for a behavioral readout showing real-time regeneration with enough fidelity to measure the changes caused by various treatments, such as growth factors, and how the system reacts to them at different stages of the regeneration process. The treatment method created a channel at the site of injury; the material was deposited into the channel to give the axons a growth path to follow during the regeneration process, as opposed to attempting to apply the treatment in the original wound site. Using manganese-enhanced magnetic resonance imaging (MEMRI) the continuity of both the connection and the subsequent disconnection was tested. We were able to follow the development of the injury site and the subsequent reconnection in some animals.

Results: We showed (1) that the extent of CNS injury can be quantified and correlated to behavior: MEMRI enabled us to both identify and quantify the extent of the injury site and performing behavioral assessments also confirmed that there was a complete disconnection without sparing; (2) that tissue healing and regeneration can be visualized in vivo: the visual system is traceable in-vivo using a nano contrast agent (NCA), manganese-chloride (MnCl_2) injected in the eye, and the visual pathways can be mapped from the retina through the optic nerve, optic chiasm, lateral geniculate and finally to the superior colliculus (SC); and (3) that chronic optic tract (OT) lesions are able to regenerate: axonal regrowth, though sparsely distributed and not visible in every case, can be seen crossing the cut regions into the SC in each of the two of three testing modes: MRI, in-vivo and post-mortem histology.

Conclusion: We created a chronic model of CNS injury that has multiple readouts; a model that is reproducible and employs three separate modes for measuring CNS regeneration. The first mode provided real-time feedback before, during and after OT transection through MRI; the second, behavioral testing, which was used for visually-guided orienting behavior; and the third mode was the histological assessment.

Anatomy and Physiology: Stem Cells

P81 DERIVATION OF RETINAL PIGMENTED EPITHELIUM CELLS FROM HUMAN EMBRYONIC STEM CELLS IN A XENO-FREE CULTURE CONDITIONS

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Background: Retinal degenerative disorders affect 50 million individuals globally. Currently treatment options are limited due to the paucity of right cell types needed for retinal transplantation. The need for retinal cells cultured in xeno-free conditions to treat diseases such as age-related macular degeneration (AMD) and retinitis pigmentosa (RP) are ever increasing. In this context, retinal cells derived from human embryonic stem cells (hESC) or from induced pluripotent cells (iPSC) holds a good potential for cell therapy intervention to treat retinal diseases. In the current study, we report a culture system in which Retinal pigmented epithelial cells (hRPE) could be derived from pluripotent stem cells and thus enable transplant ready hRPE cells for experimental and preclinical uses for retinal diseases. The method has been optimized for scale up applications to meet the need of a consistent cell dose. The hRPE cells have been further characterized for their vital functions in terms of a) polygonal morphology b) pigmentation c) polarity and d) phagocytosis. The differentiation protocols further need to be optimized for xeno-free conditions.

Methods: In a single step adherent induction process, hRPE cells were induced from hESC (H9 line) in feeder free and xeno-free culture conditions using proprietary methods of Life technologies. These cells were frozen as a mixed population containing fully and partially mature hRPE cells. These cells were further tested for quality control checks of mycoplasma, sterility, karyotype. The hRPE cells further were assessed by immuno-fluorescence assay and quantitative RT-PCR (qPCR) for selected RPE markers

Results: Our results demonstrate, hRPE progenitors cells can be derived from the H9 line. The hRPE progenitor state of the cells was monitored by the co-expression *Mitf* and *Pax6*, two prime candidate markers for early hRPEs. On further differentiation of hRPE progenitors to a more mature state, the cultures with hexagonal pigmented cells express mature markers like RPE65, CRALBP, Bestrophin, ZO1 and F-actin positive tight junctions. In a comparative assessment, the gene expression studies specific to RPE markers by qPCR showed 2-3 fold higher expression in hRPE cells compared to Fetal eye derived RPEs.

Conclusion: This study demonstrates that human ES cells can be selectively induce to produce cells with hRPE fate. This culture methodology is scalable and produces consis-

tently good quality of cells. The cells exhibit most of the hRPE features similar to the cells derived from human fetal eye. Hence these cells can serve as a good model system to study experimental retinal disease conditions or for necessary pre-clinical models.

Anatomy and Physiology: Other

P82 INTRAOCULAR PRESSURE ELEVATION ASSOCIATED WITH THE USE OF SWIMMING GOGGLES: AN INVESTIGATION OF ANATOMICAL FACTORS

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Background: Intraocular pressure (IOP) fluctuations have been considered as important risk factors for glaucoma, and swimming goggles have been suggested to elevate IOP differently. The aim of this study was to investigate anatomical factors related to the IOP increase caused by peri-ocular compression resulting from the use of swimming goggles.

Methods: Twelve eyes of 12 healthy volunteers was randomly evaluated before (M0), during (M1) and after (M2) the use of a professional swimming goggles. Holes were drilled into the lenses to allow IOP measurement by Goldmann applanation tonometry (GAT). GAT was performed before swimming goggles wear, 2 min after they were applied and after they were removed (5 min). Scleral rigidity (calculated using Schiotz tonometer readings), orbital rim area, Hertel exophthalmometry, spherical equivalent, axial eye length, corneal thickness and elastic force of the rubber (considering head circumferences) were considered as potential variables related to the IOP changes.

Results: IOP increased significantly while wearing swimming goggles by a mean \pm SD pressure of 6.2 ± 2.8 mmHg ($p = 0.0025$; Wilcoxon signed rank test). Friedman test showed significant differences in GAT results between M0, M1 and M2 (12.8 mmHg, 19.0 mmHg and 8.7 mmHg, respectively; $p < 0.0001$). Orbital rim area showed a significant correlation with IOP elevation (Spearman $r = 0.69$; $p = 0.0013$). No other factor studied could be significantly associated.

Conclusions: Based on our results, swimming goggles provoked an acute increase of the IOP. Anatomical characteristics of the peri-ocular region, specifically the orbital rim area, can be associated with different ranges of IOP elevation. Individual swimming goggles designs based on face dimensions should be considered by the manufacturers.

Laboratory Methods: Immunohistochemistry

P83 MYOCILIN LEVELS IN THE AQUEOUS HUMOR OF OPEN-ANGLE GLAUCOMA PATIENTS

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Purpose: To investigate the concentration of myocilin in the

aqueous humor of open-angle glaucoma patients, including correlations with glaucoma subtypes and intraocular pressure.

Patients and Methods: The study population comprised 85 patients with open-angle glaucoma. Glaucoma subtypes included 35 cases of high tension glaucoma (HTG), 25 cases of normal-tension glaucoma (NTG), and 25 cases of exfoliation glaucoma (ExG). Forty-five patients with senile cataract were included as control. The concentrations of myocilin in the aqueous humor were measured by plotting the densitometry readings of the aqueous humor samples against a recombinant myocilin standard curve. The percentages of samples positive for myocilin and the measured concentrations in the glaucoma and cataract groups were compared. Additionally, the relationships with the glaucoma subtypes, intraocular pressure, and glaucoma severity were analyzed.

Results: A significantly higher percentage of patients in the glaucoma subgroup were positive for myocilin compared with the cataract group. The mean myocilin concentrations among the glaucoma positive cases subgroups were not different ($p = 0.326$). Myocilin levels were significantly higher in human HTG compared with cataract group ($P < 0.05$). No significant correlations between the myocilin concentration and the intraocular pressure or the severity of glaucoma.

Conclusion: Myocilin positive patients were significantly higher in the glaucoma subgroup than in the cataract group, with a highly significant difference observed for HTG. The results suggest that further research on myocilin levels and progression might be interesting.

P84 TUMOR NECROSIS FACTOR- α AND INTERLEUKIN-6 LEVELS IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: To investigate the levels of tumor necrosis factor- α (TNF- α) and interleukin-6 (IL-6) in the aqueous humor and plasma of human eyes with primary open-angle glaucoma, (POAG) and to correlate their concentrations with the severity of glaucoma.

Patients and Methods: Thirty five patients with POAG and thirty patients with senile cataract (control group) of matched age and gender were included in the study prospectively. Aqueous humor samples were obtained by paracentesis from glaucoma and cataract patients who were undergoing elective surgery. Aqueous humor and corresponding plasma samples were analyzed for TNF- α and IL-6 concentrations by enzyme linked immunosorbent assay.

Results: TNF- α and IL-6 levels were significantly higher in aqueous humor of POAG patients with respect to the comparative group of cataract patients ($p < 0.001$). No significant difference in the levels of TNF- α and IL-6 in plasma of POAG and cataract patients. A positive correlation was found between TNF- α and IL-6 in aqueous humor of POAG patients ($p < 0.001$). Significant correlation was found between TNF- α or IL-6 levels and severity of visual field loss in moderate stage ($p < 0.001$).

Conclusion: Increased levels of TNF- α and IL-6 aqueous humor may be associated with POAG. In addition, TNF- α and IL-6 may be useful pro-inflammatory cytokines levels in aqueous humor of POAG patients. TNF- α and IL-6 concentrations

in aqueous humor are significant with visual field loss in patients with POAG.

P85 EFFECT OF PROSTAGLANDIN ANALOGS ON OCULAR COMPLEMENT SYSTEM

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Background: Prostaglandin (PG) analogs are number one prescribed medication for the treatment of glaucoma. Their safety profile is excellent except induction of anterior uveitis and cystoids macular edema on some occasions. Inflammation improves upon the cessation of the medication. Complement system is a major component of the inflammatory cascade and the information about PG analog use and its effect on complement system is scarce. The purpose of this study was to study the effects of all clinically available PG analogs – Latanoprost, Travoprost-SofZia, and Bimatoprost on ocular complement system.

Methods: Latanoprost, Travoprost-SofZia, and Bimatoprost were applied daily (once only) via topical route to both eyes of male Lewis rats for total of 26 days. Control rats received a similar treatment with saline. Animals were sacrificed 24 hours after last treatment and eyes were harvested. Paraffin sections of the harvested eyes were stained with hematoxylin and eosin stain (H&E). Immunofluorescence immunohistochemistry was performed on paraffin sections using anti-rat C3 antibody. Harvested eyes were also utilized for Western blot analysis for C3 and its activation products.

Results: Analysis of H&E stained sections did not detect inflammatory cells in the eyes of Lewis rats that received Latanoprost, Travoprost-SofZia, and Bimatoprost. Interestingly, levels of C3 and its activation products in the eyes of animals treated with Latanoprost, Travoprost-SofZia, and Bimatoprost were similar to those in control rats.

Conclusion: On the basis of these results we conclude that topically administered prostaglandin analogs have no effect on complement system in rat eyes.

Laboratory Methods: Genetics

P86 SIBLINGS WITH CONGENITAL GLAUCOMA

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Aims: To analyze clinical and genetic features of PCG in a family with 2 affected sons and to detect if the unborn child of the pregnant mother inherited the disease-causing mutation.

Case presentation: A family of Romany ethnic group with unaffected parents and their 2 sons affected by PCG were investigated clinically and genetically. DNA samples from all family members were analyzed for mutations in CYP1B1 gene. The mother is affected by severe myopia. The two sons affected by PCG. Age of onset was in the first two month of life for both brothers. The sibs shared similar PCG phenotype

and the missense mutation E229K identified in homozygous form in exon 2 from the CYP1B1 gene. The mother being pregnant again asked for genetic counseling. Prenatal diagnosis for PCG was performed and included cytogenetic and DNA analysis. Ultrasound examination of the pregnant woman revealed a singleton pregnancy with enlargement of the eye. Karyotype of the fetus indicated a normal female but DNA analysis confirmed the CYP1B1 mutation.

Conclusion: We suggest genetic counseling and prenatal molecular testing for all family cases. This will further help in the prevention of childhood blindness.

P87 THE ASSOCIATION OF TP53 GENE (CODON 52) POLYMORPHISMS WITH SUSCEPTIBILITY TO ACUTE PRIMARY ANGLE-CLOSURE GLAUCOMA IN BRAZILIAN PATIENTS

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Purposes: TP53 is one of the key regulators of apoptosis, and polymorphisms in its codon 72 have been investigated in order to determine association with several diseases, including glaucoma. Codon 72 may encode for arginine (CGC-Arg) or proline (CCC-Pro), due to the presence of a single nucleotide polymorphism at the second base pair. The purposes of this study were: (1) to determine the allelic and genotypic polymorphism of the TP53 gene (codon 72) in Brazilian patients with primary angle-closure glaucoma (PACG) and in healthy controls and (2) verify the allelic association (Proline and Arginine) of TP53 (codon 72) in PACG patients with and without history of acute crisis for pupillary block.

Methods: A total of 66 unrelated PACG patients (47 with a history of acute crisis and 19 with no history of crisis PACG acute) and 72 unrelated healthy matched controls were studied. DNA was amplified by polymerase chain reaction. The exon 4 region of gene TP53 was amplified and digested with the restriction enzyme BseDI (restriction fragment length polymorphism). Statistical analysis of genetic associations was performed by chi-square (χ^2) with Yates correction or by two-tailed Fisher exact test when necessary.

Results: (1) No significant difference was observed in genotype frequency for the polymorphisms (PRO / PRO, ARG / ARG and ARG / PRO) of the p53 gene between PACG and control groups ($p = 0.3984$). (2) The frequency of the alleles ARG and PRO was significant different between the PACG groups with and without acute crisis ($p = 0.0251$ / OR = 2.9).

Conclusions: These results may suggest a potential role for p53 in PACG with a history of acute glaucoma.

P88 ASSOCIATION BETWEEN CYCLIN-DEPENDENT KINASE INHIBITOR 2B GENE POLYMORPHISM AND PRIMARY OPEN-ANGLE GLAUCOMA

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Background: It was reported that the cyclin-dependent kinase inhibitor 2B (CDKN2B) gene polymorphism was associated with vertical cup-disc ratio, and that there was marginal

evidence for association of *CDKN2B* with primary open-angle glaucoma (POAG). As the next step, the present study was performed to assess the association of *CDKN2B* with the phenotypic features of POAG.

Methods: Four hundred and twenty-five Japanese patients with POAG, including normal-tension glaucoma (NTG, $n = 213$) and high tension glaucoma (HTG, $n = 212$), and 191 control subjects without glaucoma were analyzed for *CDKN2B* gene polymorphism (rs1063192). The genotype and allele frequencies were compared between the patients with NTG or HTG and the control subjects. A logistic regression model was used to study the effects of the rs1063192 allele when comparing the NTG or HTG patients with control subjects. Demographic and clinical features, including maximum intraocular pressure (IOP), were compared between the POAG patients with and without the rs1063192 C allele.

Results: There was a significant difference ($p = 0.0057$, Chi-square test) in the genotype frequencies between the NTG patients (CC: 1.4%, CT: 24.9%, TT: 73.7%) and control subjects, (CC: 6.3%, CT: 31.9%, TT: 61.8%) and the frequency of the T allele was significantly higher ($p = 0.0023$, Fisher's exact test) in patients with NTG in comparison to the control subjects (86.2% vs. 77.7%). Adjusted for age, gender, refractive error, and IOP, an almost 1.7 times increased risk of NTG ($p = 0.031$, odds ratio 1.72, 95% confidence interval 1.05 to 2.81) was found with the T allele. There were no significant differences in the demographic and clinical features, including the maximum IOP, between the POAG patients with or without the rs1063192 C allele.

Conclusion: *CDKN2B* gene polymorphism is considered to be a non-IOP related genetic factor for NTG.

P89 CANDIDATE GENE ANALYSIS OF PRIMARY OPEN-ANGLE GLAUCOMA IN A JAPANESE POPULATION USING A CUSTOM CHIP

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Background: Although more than 20 kinds of genes, including *MYOC*, *OPTN*, and *WDR36*, have to date been reported as glaucoma-related genes, there has yet to be a study describing a candidate gene analysis of primary open-angle glaucoma (POAG) (including normal-tension glaucoma) using a large population. In this study, we analyzed the single nucleotide polymorphisms (SNPs) that were previously reported as POAG-associated SNPs using a large Japanese population.

Methods: We enrolled 521 POAG patients (250 males and 271 females; mean age: 61.5 ± 14.1 years) and 519 normal subjects (188 males and 331 females; mean age: 55.9 ± 14.6 years) without glaucoma or a family history of glaucoma. Written informed consent was obtained from all participants. Genomic DNA was extracted from the subjects and genotyped with the Illumina iSelect HD Custom Genotyping Bead-Chip (Illumina, Inc. San Diego, CA). In total, 154 SNPs consisting of 1) 55 SNPs from *MYOC*, *OPTN*, and *WDR36*, 2) 15 SNPs from the previously reported 22 genes except the SNPs from category 1, 3) 48 dbSNPs on the exons of 22 genes from category 2; and 4) 36 dbSNPs located on ~1 kb upstream of the 22 genes from category 2 were analyzed by

chi-square test for both allele and genotype frequency.

Results: We obtained a significant ($p < 0.05$) SNP (rs11258194; M98K) from *OPTN* and 4 SNPs from *WDR36* (rs1993465, rs13153937, rs6859041, and rs2034896) by the allele- and genotype-frequency analyses, respectively. We also obtained 2 significant SNPs on the exons of the $\beta 2$ receptor gene, *ADRB2* (rs1042720), and 1 of the reductase genes, *MTHFR* (rs11559040), by the allele- and genotype-frequency analyses, respectively.

Conclusions: *OPTN* M98K, 4 SNPs of *WDR36*, and 1 SNP each of both *ADRB2* and *MTHFR* were found to be significant. These SNPs might be important for the pathogenesis of glaucoma.

P90 GENETIC STUDY OF A CHINESE FAMILY WITH PRIMARY CONGENITAL GLAUCOMA

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Background: Primary congenital glaucoma (PCG, OMIM 231300) is one of the common causes of innate blindness which usually manifests within the first three years of life. It is characterized by marked increased intraocular pressure (IOP) resulting from obstruction of aqueous humor drainage, which was caused by the developmental anomalies at the anterior chamber angle and trabecular meshwork. Elevated IOP can lead to severe optic nerve damage and eventually blindness if untreated. PCG is mainly inherited as an autosomal recessive condition with incomplete penetrance. Linkage studies have shown genetic heterogeneity of PCG and have mapped three loci to chromosomes 2p21 (GLC3A), 1p36 (GLC3B), and 14q24 (GLC3C). Molecular screening of the PCG families has determined that mutations in the cytochrome P450 1 B1 (*CYP1B1*) at the GLC3A locus are the main known causes of PCG. More than 100 mutations of *CYP1B1* have been reported in the Human Gene Mutation Database. Nonetheless, limited role of myocilin (*MYOC* at chromosome 1q24-25) has been suggested in PCG pathogenesis. In this study, we recruited a 3-generation Chinese family with PCG and investigated the genetic cause in this family.

Methods: The proband and 19 members of a 3-generation Chinese Han family with PCG were recruited for complete ophthalmological investigation and genetic study. Clinical diagnosis was confirmed by slit lamp biomicroscopy, gonioscopy, optic disc evaluation, measurement of intraocular pressure, and corneal diameter. Mutation screening was performed for the coding exons 1-3 of *MYOC* gene and the coding exons 2-3 of *CYP1B1* gene by polymerase chain reaction followed by direct DNA sequencing.

Results: In the second generation, primary congenital glaucoma was diagnosed in 3 out of 4 male siblings. There was no sign of abnormality in the other family members. Three reported *CYP1B1* mutations (p.L107V, p.E173K, p.V198I) were identified in this family. The homozygous mutation p.E173K was detected in all the 3 affected male siblings and one unaffected female sibling. In addition, three single polymorphisms (p.R48G, p.A119S, p.D449D) were identified. No disease-causing mutation in *MYOC* was found in all participants.

Conclusions: Our result with the homozygous mutation p.E173K of *CYP1B1* was not in accordance with the previous

studies which reported that none of the unaffected siblings and normal control subjects possessed this mutation. To the best of our knowledge, this is the first case demonstrating a variable penetrance of this *CYP1B1* mutation p.E173K. In addition, screening of *CYP1B1* in normal control subjects and the other causative gene (e.g. *LTBP2*) should be underway to further explore the genetic basis of PCG in this family.

P91 ASSESSMENT OF ASB10 MISSENSE VARIANTS IN GERMAN AND ITALIAN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Background: Mutations in ASB10 have been recently reported as responsible for the primary open-angle glaucoma (POAG) in the original GLC1F family. In this work we investigated the prevalence of ASB10 variants in patients with POAG, normal-tension glaucoma (NTG) and juvenile primary open-angle glaucoma (JOAG) and control subjects of German and Italian descent.

Methods: Mutation screening was performed by sequencing the entire ASB10 coding region in 986 patients and 376 control subjects from Germany and 26 patients as well controls from Italy. We performed structural analysis based on homology modeling to explore possible consequence of non-synonymous variants on protein structure.

Results: Altogether, we detected in the coding regions of the ASB10 gene 23 non synonymous variants mainly distributed in the ankyrin-repeat domains of the protein. Seven of these were also present in control subjects. Molecular modeling predicts that 12 non synonymous variants have a destabilizing effect on the 3D-structure of the ankyrin-repeat domains. Motif analysis shows that other 7 non synonymous variants affect different phosphorylation sites. Taking into account only non synonymous variants with a predicted impaired function we could count a total of 19 variants in 55 patients (5.6%) and 8 healthy subjects (2.1%; $p = 0.0057$).

Conclusions: Our findings extend the evidence that ASB10 is involved in the aetiology of glaucoma, although its exact role is still unknown. As for other genes associated to this disease, the large variability of rare variants supports the hypothesis for POAG of 'common disease-rare variants'. ASB10 gene mutations are associated with adult onset glaucoma both with high and low intraocular pressure and also with juvenile open-angle glaucoma.

P92 AXENFELD-RIEGER, MICROCEPHALY, AND CONGENITAL HYPOTHYROIDISM: A NEW SYNDROME?

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We report a family in which 8 individuals in 3 generations have anterior chamber abnormalities, primarily Axenfeld-Rieger type anomalies along with varying combinations of congenital hypothyroidism, microcephaly, developmental delay and minor limb anomalies.

Method: Clinical examination and genetic testing on mem-

bers of 3 generations affected with congenital glaucoma associated with anterior segment anomalies similar to Axenfeld-Rieger syndrome.

Findings: Anterior segment findings are most compatible with Axenfeld-Rieger syndrome: anteriorly displaced Schwalbe's line is thick and ropy, iris findings variable, and degree of glaucoma also variable. Additionally there is a combination of congenital hypothyroidism, microcephaly, developmental delay and minor limb anomalies. Although they have minor facial anomalies similar to other patients with Rieger syndrome (flat midface, thin upper lip), these individuals do not fit any of the known syndromes with Axenfeld-Rieger anomaly such as Rieger syndrome type 1 with hypodontia and periumbilical abnormalities due to mutations in *PITX2*; Rieger syndrome type 2 with dental, hearing, and cardiac anomalies, hydrocephalus; Rieger syndrome type 3 with cardiac and sensorineural hearing loss due to mutations in *FOXC1*, or other syndromes with anterior chamber anomalies such as SHORT syndrome or Peters Plus. One affected child with bilateral congenital glaucoma due to Rieger anomaly with congenital hypothyroidism, microcephaly with OFC -3SD, and developmental delay tested negative for mutations in *PITX2* and *FOXC1*. He also had a normal karyotype (46, XY), CGH microarray and extensive biochemical testing including lactate, pyruvate, very long chain fatty acids, amino acids, organic acids, carnitine, acylcarnitine profile, and carbohydrate deficient transferring all with normal results. MRI of brain demonstrated minimal volume loss. Expression of the condition varied among family members. One obligate heterozygote was said to be normal but never had a detailed examination. Anterior chamber abnormalities including Axenfeld-Rieger anomaly, glaucoma and/or retinal detachment were found in all 8 affected. Of these, 4 had congenital hypothyroidism; 5/6 head measurements were microcephalic and the 6th had an OFC just above the 3rd percentile. Four of the affected had hearing loss. Half of the affected also had developmental delays not attributable to vision or hearing impairment. All had minor limb anomalies including one with hypoplastic toes and one with severe metatarsus adductus.

Conclusion: We believe that family has a new autosomal dominant syndrome with Axenfeld-Rieger anomaly, congenital hypothyroidism, microcephaly, developmental delay, hearing loss and minor limb anomalies.

P93 THE SEARCH FOR THE GENE THAT CAUSES CAVITARY OPTIC DISC ANOMALY

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Purpose: Cavitory optic disc anomaly (CODA) is a heritable form of congenital optic nerve disease that resembles glaucoma. We previously mapped the gene that causes CODA to a 13.5 Mbp region of chromosome 12q that contains 245 genes. The purpose of our current research is to identify which of these genes causes CODA with studies of a large pedigree with 17 affected members.

Methods: We tested members of the CODA pedigree for disease-causing mutations in genes within the locus on chro-

mosome 12q using a range of techniques. We tested DNA samples from affected family members for coding sequence mutations using both standard DNA sequencing of individual genes as well as parallel sequencing of the exons of all of the known genes in the locus. Affected family members were also tested for copy number variations (duplications or deletions) of chromosome 12q that might cause CODA using comparative genome hybridization assays.

Results: We tested the coding sequence of over 75 top candidate genes individually and detected no plausible disease-causing mutations. Parallel sequencing and comparative genome hybridization studies are currently underway.

Conclusions: Our efforts to identify the gene that causes CODA will ultimately provide insights into the pathogenesis of other optic nerve diseases such as normal-tension glaucoma and primary open-angle glaucoma

Laboratory Methods: Molecular Biology incl. Sirna

P94 ASSOCIATION BETWEEN ADRB2 GENE POLYMORPHISMS AND OCULAR HYPOTENSIVE RESPONSE TO TOPICAL BETAXOLOL IN PATIENTS WITH OPEN-ANGLE GLAUCOMA

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Background: Glaucoma is a disease characterized by loss of retinal ganglion cells, excavation of the optic nerve head, visual field defects and eventually blindness. Glaucoma is the second leading cause of blindness worldwide. The main risk factors include elevated intraocular pressure, age, ethnicity, family history and myopia. B-adrenergic receptors (ADRB), mainly ADRB2 (B-2 adrenergic receptor) are expressed in the ciliary body, trabecular meshwork and wall of the vasculature of the optic nerve. Betaxolol is a beta adrenergic blocker that acts selectively on beta 1 receptors. The mechanism of action at eye level is not well understood, it is assumed that betaxolol inhibits the adrenergic tone and therefore the formation of aqueous humor in the ciliary body. Its ocular hypotensive effect starts at 30 minutes, is maximal at 2 hours and persists for 12 hours. In the ciliary body, ADRB2 has more expression (90%) than ADRB1 (10%). Japanese population studies found that the Gly16 allele has glaucoma at an earlier age, while carriers of the Glu 27 have increased intraocular pressure at the time of diagnosis.

Methods: The present study aimed to determine the association between ADRB2 polymorphisms and the ocular hypotensive response to betaxolol in Mexican patients with glaucoma. Thirty-three patients and thirty controls were genotyped at the Arg16Gly and Gln27Glu polymorphisms through PCR and DNA sequencing analysis. Demographic data, disease severities, ocular pressure, tests and betaxolol medication were recorded for each patient.

Results: The frequencies of the Arg16 and Gln27 alleles

were found to be 48.8% and 72.7%, respectively. The homozygous Arg16/Gln27 and Gly16-Gln27 haplotypes were estimated with frequencies of 5 (15.2%) and 10 (30.3%), respectively. We found a high prevalence of these polymorphisms in both populations. No differences between control group and betaxolol treatment group were found to be present.

Conclusion: We concluded that other genetic factors, apart from ADRB2, are responsible in the ocular hypotensive response to topical betaxolol in patients with open-angle glaucoma.

Laboratory Methods: Cellular Biology

P95 EFFECT OF THE TRAVOPROST/TIMOLOL MALEATE FIXED COMBINATION (DUOTRAV®) ON HUMAN CULTURED CONJUNCTIVAL CELLS

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Background: Travoprost 0.004% ophthalmic solution (Travatanz®, Alcon Laboratories, Inc., Fort Worth, TX, USA) was provided with benzalkonium chloride (BAC) free glaucoma medication from 2007 in Japan. Recently the travoprost 0.004%/timolol 0.5% fixed combination (DuoTrav®, Alcon Laboratories, Inc., Fort Worth, TX, USA) gained commercial approval in Japan. Travatanz® containing SofZia™ (Alcon Laboratories Inc., Fort Worth, TX, USA), a non-BAC-preserved prostaglandin analog, can be used clinically. SofZia™ is a proprietary ionic buffer system comprised of zinc, borate, and sorbitol that does not contain BAC. Basic experiments in animals and cultured cells have revealed that travoprost preserved with SofZia™ is less cytotoxic than prostaglandin analogs preserved with BAC. DuoTrav® contains POLYQUAD® that does not contain BAC but compound was different from Travatanz®. However, up to the time of preparation of this report, there were no studies on the effects of POLYQUAD®. We studied the inhibitory effect of DuoTrav® ophthalmic solution on human cultured conjunctival cell proliferation.

Methods: Human cultured conjunctival cells were inoculated, 4000 cells per well on the 96-well plates, and each drug was administered after 24 hours. Duo Trav® (DUO), was compared with Travatanz® (TRZ) and latanoprost 0.005%/timolol 0.5% fixed combination (Xalcom®: XAL, Pfizer Inc., New York, NY, USA) combination ophthalmic solution of the Latanoprost. These drugs were diluted with the medium so that the final concentration became 1/30, 1/100 and 1/300, and 10 µL of each solution was administered. Experiments were performed at 24 hours after administration: Cell activity was measured three times via absorbance after reaction with WST-8 and analyzed via ANOVA by JMP8.

Results: In all groups, the cell activity decreased concentration-dependently. At concentration of 1/300 showed no significant difference in the all groups. However 1/100 and 1/30 showed significantly different (ANOVA: $p < 0.001$) with XAL and Travoprost solutions but no significance in DUO and TRZ.

Conclusions: DuoTrav® ophthalmic solution with POLYQUAD® showed same safely inhibitory effect on the cultured

human conjunctival cells as Travatanz® ophthalmic solution containing SofZia™.

P96 OCULAR SURFACE DISEASE INDUCED BY ANTI-GLAUCOMA MEDICATION. A CLINICO-PATHOLOGICAL STUDY

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Aim: To determine if chronic anti-glaucomatous medications containing preservatives induced alterations in the tear film and ocular surface.

Method: In a prospective study 40 newly diagnosed cases of glaucoma patients were randomized into 4 groups of 10 eyes each. Group 1 was put on Timolol Maleate 0.5% with BAK 0.01% twice daily dose, group 2 was put on Bimatoprost (0.3 mg) with BAK 0.005% once daily dose, group 3 was put on Travoprost 0.004% with BAK 0.015% once daily dose and group 4 was put on Timolol Maleate (5 mg) + Bimatoprost (0.3 mg) with BAK 0.005% once daily dose. All the patients were followed up for a period of 12 months. The evaluation was performed subjectively by determination of subjective symptoms via a questionnaire and objectively by examination findings such as slit lamp biomicroscopy, conjunctival staining with 2% fluorescein and 1% lissamine stain, Schirmer's test, TBUT and Conjunctival Impression Cytology.

Results: Slit lamp biomicroscopy showed SPKs and follicles to be more common in group 1 (30% and 40% respectively) and group 4 (20% and 30% respectively). Hyperaemia was more commonly seen in group 2 (50%), group 3 (40%) and group 4 (30%) at the end of 6 months. Hyperaemia decreased to 20% in group 2 and group 3 at the end of 1 year of study. Reduction in mean Schirmer's test value and TBUT was statistically significant in group 1 (p value = 0.002 and 0.019 respectively) and group 4 (p value = 0.056 and 0.025 respectively). Fluorescein staining was higher in 50% patients in group 1 and 4.30% patients in group 2 and 50% of patients in group 3. Significant higher lissamine staining was seen in group 1 (p value = 0.015) and group 2 (p value = 0.033). Conjunctival impression cytology demonstrated increase in cytological grading in all the 4 groups but was statistically significant in group 4 with p value of 0.021. Increment in mean OSDI score at the end of 1 year was statistically significant for all the 4 drug groups.

Conclusion: Our study indicates a high prevalence of signs and symptoms of ocular surface disease in patients on long term topical antiglaucoma medication. All the drugs in our study had BAK as preservative. We however, cannot state conclusively, that the use of BAK containing drops is the cause of OSD. Either the preservative alone or the active drug molecule alone or both together could be responsible for the ocular surface changes observed.

P97 IN-VITRO ASSAYS ON POLYDIOXANONE MEMBRANES USE AS MITOMYCIN C DELIVERY SYSTEM FOR GLAUCOMA TREATMENT

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Purpose: The aim of this study was to investigate the release kinetic of Mitomycin C (MMC) delivered onto polydioxanone (PDO) membrane using analytical chemistry and to evaluate this cellular effect to control and quantify its ability to avoid human ocular fibroblast to proliferate. Indeed, the development of an effective long lasting drug delivery system after glaucoma surgery could minimize side effects and increase patient compliance.

Methods: PDS membranes, including or not MMC, were immersed in fresh saline to determine release kinetics. After many developments to optimize the analytical conditions of the quantification of the delivered MMC, analysis was performed by high-pressure liquid chromatography (HPLC). HPLC column retention time was determined for drug released compared to a standard curve to determine the exact amount of released MMC. In a second time, the supernatant was added to a primary ocular fibroblast cell culture to determine the efficiency of the MMC delivered by the system and the inhibition proliferation rate. Then membranes, containing or not MMC, were added directly on the cell layer or placed in a transwell device and the inhibition proliferation rate was also determined for 10⁻⁵ g of MMC.

Results: The kinetic of the MMC release by the PDO membrane has been determined. A perfect correlation between the size of the membrane including MMC and the amount of MMC delivery has been observed, each mm² delivers 7.10⁻⁷ g of MMC and the retention time is 4.1 minutes. In three days the whole amount of MMC has been delivered by the membrane.

Using MMC-PDO membrane supernatant or MMC-PDS membrane placed in transwell device, the inhibition of the proliferation was respectively 95.4% and 91.1% (p < 0.001) with no statistical difference between the 2 techniques.

Conclusions: With the help of the MMC-PDO we have quantified the long time drug delivery in an *in vitro* model. MMC delivered by this system is efficient on human primary ocular fibroblasts and could statistically inhibit the cellular proliferation. Further tests on rabbit glaucoma model have highlighted no local inflammatory reaction with the polydioxanone membrane and less scar tissue formation with MMC-PDO membrane.

P98 A METHOD FOR STANDARDIZED SCREENING OF POTENTIAL NOVEL NEUROPROTECTIVE AGENTS EX VIVO

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Background: Our laboratory has developed an *ex vivo* organotypic retinal explant model to examine retinal survival mechanisms. The aim of the current study was to further develop the explant model as a rapid screening tool for potential novel neuroprotective agents, in particular compounds already licenced for other indications.

Methods: Eyes from adult Sprague Dawley rats were enucleated immediately post mortem and intact retina was dissected from the optic cup. This was divided radially to make 4 retinal explants per eye. Tissue from one eye was used to trial drug treatment and tissue from the other eye was used as an internal control. The tissue was placed ganglion cell side up on millipore filters in a 24 plate cell culture well with

300 μ L N2/B27 culture media. The explant was situated at the air-media interface on the filter and placed in a humidified incubator for a number of days. Novel therapies were trialed by adding them at appropriate concentrations to the culture media which was changed regularly as well as adding small doses daily of this mixture to the surface of the explant. At the conclusion of each experiment, the cells were fixed in 4% paraformaldehyde and stained in wholemount with β III Tubulin and Islet 1 – markers for retinal ganglion cells to provide estimates of ganglion cell density.

Results: Using our explant technique, normal retinal architecture is preserved in the explanted tissue for up to 2 weeks. Measurement of the RGC density at different timepoints suggested that the 4 days *ex vivo* was optimal for assessment of potential neuroprotective effects. Viable ganglion cells at an average density of 993.44 ± 63.67 cells/mm² (n = 23) were observed in explanted retinas 4 days post enucleation. Analysis of the effects of valproic acid, ibuprofen, aspirin, colchicine, N-acetyl cysteine, diclofenac and ketorolac on RGC survival in culture is ongoing and will be presented at the meeting.

Conclusion: Our retinal explant model may be a useful tool in screening for potential novel neuroprotective agents in a standardized and internally controlled fashion. In addition, it is possible to screen large numbers of candidate compounds in a relatively short space of time whilst reducing the number of animal procedures required.

P99 EVALUATION OF THE CYTOTOXICITY OF PROSTAGLANDIN ANALOG EYE DROPS ON HUMAN CONJUNCTIVAL CELL CULTURES

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Background: Prostaglandin analogues (PGs) are known to be effective for the treatment of glaucoma patients by lowering the intraocular pressure. However, cytotoxic effects of these drugs on the human conjunctiva are not well known. In this work, we have evaluated the cytotoxic effects of several PGs ophthalmic solutions widely used for the clinical control of the intraocular pressure using an *ex vivo* cell culture model.

Methods: Primary cell cultures of human conjunctival fibroblasts were established from biopsies of healthy patients. The cells were isolated by enzymatic digestion using collagenase type I from *Clostridium histolyticum* and cultures were grown at 37°C temperature with 5% of CO₂. These cells were maintained using Dulbecco's Modified Eagle Medium (DMEM) supplemented with 10% fetal bovine serum. Once the cell cultures were established, we investigated the cytotoxic effects of sequential dilutions of 0.3% bimatoprost (Lumigan®), tafluprost 0.015% (Safutan®), travoprost 0.004% (Travatan®) and latanoprost 0.005% (Xalatan®) on human conjunctival cell cultures by using MTT (bromide reduction of 3 – (4,5 – dimethylthiazol-2-yl) -2,5-diphenyl tetrazolium) and WST-1 (formazan crystal formation by degradation of tetrazolium salts) methods. Both the MTT and the WST-1 are non-radioactive colorimetric quantitative assays that measure mitochondrial enzyme activity, which is directly proportional to the number of viable cells. We evaluated each PGs for 1 hour at 6 different concentrations (0.1%, 1%, 5%, 25%, 50%

and 100%) in triplicate. We also included a negative control with medium and a positive control with 2% Triton X-100, a well-known inductor of cell death.

Results: At the time of 1 hour, the MTT assay suggested that the four PGs showed a significantly higher level of cytotoxicity than the control medium and there were no significant differences with the positive control (Triton X-100). For the WST-1 assay, the cytotoxic effects of bimatoprost, travoprost and latanoprost were found to be similar to positive controls, although tafluprost was not as toxic as triton at 1 hour (p < 0.05).

Conclusion: All drugs showed significant levels of cytotoxicity at higher concentrations, although tafluprost seems to be less toxic at this time. This fact could likely be related to the fact that tafluprost does not have benzalkonium chloride on solution. Further studies are needed to clarify the role of this preservative in cell death.

P100 ROSIGLITAZONE ATTENUATES ACTIVATION OF HUMAN TENON'S FIBROBLASTS INDUCED BY TRANSFORMING GROWTH FACTOR-B1

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Purpose: To investigate the inhibition role of the synthetic peroxisome proliferators-activated receptor (PPAR)- γ agonist rosiglitazone on TGF- β 1 induced human Tenon's fibroblasts activation, and to access the possible mechanism of it.

Methods: Human Tenon's fibroblasts were grown in culture, pretreated with different concentrations of rosiglitazone (5 μ mol/l or 10 μ mol/l) and then activated with 5 ng/ml TGF- β 1. Cell count kit -8 assay utilizing water-soluble tetrazolium Salts was accessed for cell viability and proliferation, wound closure assay was performed to assess cell migration, the expression of Alpha smooth muscle action (α -SMA), connective tissue growth factor (CTGF), type I collagen (COL I), was detected with RT-PCR, Western blot, α -SMA was also examined with immunofluorescence. PPAR- γ , p-smad2/3, were assessed by western blot.

Results: Rosiglitazone could attenuate TGF- β 1 induced up-regulation of α -SMA, CTGF and COL I. It could availably increase the expression of PPAR- γ , and effectively attenuated the phosphorylation of Smad 2/3.

Conclusions: Rosiglitazone can effectively attenuate TGF- β 1 induced myofibroblasts transdifferentiation in HTFs, without obvious toxic effect. The possible mechanism might be rosiglitazone interfering in the TGF- β / Smad signal pathway.

P101 DNA DAMAGE CAUSES DEATH OF RETINAL GANGLION CELLS

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Background: Pathophysiology of glaucoma is characterized by the development of retinal ganglion cell (RGC) death. Recently in many of neurodegenerative disease, such as Alzheimer's disease and Huntington's disease, the importance of DNA damage responses in their developments have been focused. Some molecular targets in the DNA damage response pathways in these diseases are now expected to improve new treatments. However the effects of DNA dam-

age in RGCs and the development of glaucoma is still unknown. Here we have tried to examine the roles for DNA damage responses in RGCs.

Methods: RGCs were purified from dissociated retinal cells from 6- to 8-day-old Wistar rats by a two-step immunopanning procedure. The purified RGCs were seeded on glass coverslips in culture plates and incubated for 3 days. After the 3 days of incubation, glutamate used as an experimental stress to RGCs was added. DNA double strand bleaks were detected by immunofluorescence of gamma-H2AX, since phosphorylation of Serine 139 within the SQ motif of histone H2AX yields a form known as gamma-H2AX in response to double-strand DNA damage. Cell death was determined by Cell Viability Reagent Kit (Thermo Scientific).

Results: Focus formations of gamma-H2AX of RGCs and cell death were increased by the supplemented glutamate dose-dependently. Glutamate induced prompt DNA double-strand breaks in RGCs and consequent cell death.

Conclusion: Glutamate induced DNA damage and cell death in RGCs. These findings show the possible roles of DNA damage response in glaucoma progression. Further studies on the mechanism of DNA damage by glutamate, and the pathway of the DNA damage response to the cell death in RGCs are required.

P102 OXIDATIVE STRESS AND CALCIUM OVERLOAD IN HUMAN LAMINA CRIBROSA CELLS FROM GLAUCOMA DONORS

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Background: Oxidative stress and alterations in calcium (Ca^{2+}) regulation are implicit in the pathological changes of the optic nerve head (ONH) associated with glaucoma. The purpose of this study was to compare levels of oxidative stress in glial fibrillary acid-negative protein (GFAP) lamina cribrosa (LC) cells obtained from normal (NLC) and glaucomatous (GLC) human donor eyes and to also examine mitochondrial function and calcium homeostasis in this region of the ONH.

Methods: Intracellular reactive oxygen species (ROS) production was examined by a thiobarbituric acid reactive substances (TBARS) assay which measures malondialdehyde (MDA), a naturally occurring product of lipid peroxidation and is used as an indicator of oxidative stress. Mitochondrial membrane potential (MMP) and intracellular calcium ($[\text{Ca}^{2+}]_i$) levels were evaluated by flow cytometry using the JC-1 (5,5',6,6'-tetrachloro-1,1',3,3'-tetrabenzimidazolecarboxyanine iodide) and fluo-4/AM probes respectively. Anti-oxidant and Ca^{2+} transport system gene and protein expression were determined by RT-PCR using gene-specific primer/probe sets and western immunoblotting respectively.

Results: Intracellular ROS production was increased in GLC compared to NLC ($27.19 \pm 7.05 \mu\text{M}$ MDA vs $14.59 \pm 0.82 \mu\text{M}$ MDA, $p < 0.05$). Expression of the anti-oxidants Aldo-keto reductase family 1 member C1 (AKR1C1) and Glutamate cysteine ligase catalytic subunit (GCLC) were significantly lower in GLC ($p = 0.02$) compared to NLC control. MMP was determined to be lower in GLC ($57.5 \pm 6.8\%$) compared to

NLC ($41.8 \pm 5.3\%$). $[\text{Ca}^{2+}]_i$ levels were found to be higher ($p < 0.001$) in GLC cells compared to NLC. Expression of the plasma membrane Ca^{2+} /ATPase (PMCA) and the sodium-calcium (NCX) exchangers were lower, while intracellular sarco-endoplasmic reticulum Ca^{2+} /ATPase 3 (SERCA) was higher in GLC compared to NLC. Subjection of NLC cells to oxidative stress ($200 \mu\text{M}$ H_2O_2) reduced expression of NCX-1, PMCA-1 & -4 as determined by RT-PCR.

Conclusions: Our data supports oxidative stress, mitochondrial dysfunction and impaired calcium extrusion in GLC cells and suggests their importance in the pathological changes occurring at the ONH in glaucoma. Future therapies may target reducing oxidative stress and / or $[\text{Ca}^{2+}]_i$.

P103 LIPOFUSCIN ACCUMULATION IN GLAUCOMATOUS HUMAN LAMINA CRIBROSA CELLS

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Background: Disease associated alterations in the phenotype of glial cells of the lamina cribrosa are implicated in changes occurring at the optic nerve head (ONH) in glaucoma. Lipofuscin is an intralysosomal, non-degradable, autofluorescent macromolecule which accumulates in the peri-nuclear region of cells with oxidative stress induced elevations in the rate of mitochondrial turnover. The objective of our study was to compare levels of lipofuscin-like material in lamina cribrosa cells from normal human donor eyes (NLC) and from glaucomatous human donor eyes (GLC).

Methods: NLC and GLC cells were examined by transmission electron microscopy (TEM) and the number of peri-nuclear lysosomes per high powered field ($\times 20,000$) recorded. The cells were stained with sudan black B, to assess peri-nuclear lipophilic body number and size. Cultures were examined using live cell fluorescence microscopy and cellular autofluorescence quantified by flow cytometry (emission at 563-607 nm). Real-time PCR (RT-PCR) was used to measure the cellular content of Cathepsin D and Autophagy protein 5 (ATG5) mRNA in NLC and GLC. Cellular Protein levels of the former were analysed at Western blot.

Results: The number of peri-nuclear lysosomes was increased in GLC compared to NLC (11.1 ± 3.8 v 4.2 ± 3.7 , $p = 0.002$). Increased sudan black B staining of peri-nuclear lipophilic body number (22.10 ± 3.57 v 13.77 ± 5.66 , $p = 0.07$), and size (2023.6 ± 611.23 v 862.8 ± 74.23 , $p = 0.04$) was also observed in GLC compared to NLC. Perinuclear lysosomes were found to be autofluorescent and an increase in whole cell autofluorescence was observed in GLC relative to NLC (83062 ± 45.1 v 41.01 ± 3.9 , $p = 0.2$). There was no significant difference between the two cell groups in cellular levels of Cathepsin D mRNA or protein. There were significantly higher levels of ATG5 mRNA in GLC samples when compared to NLC samples.

Conclusions: We present evidence supportive of increased lipofuscin formation as being characteristic of lamina cribrosa cells derived from donors with glaucoma. The persistence of

this phenomenon *in vitro* is suggestive of oxidative stress and alterations in mitochondrial function as being of importance in glaucoma. Potential future anti-glaucoma strategies may therefore include attempts at reducing oxidative stress, and improving mitochondrial turnover by the stimulation of cellular degradation systems.

Laboratory Methods: Biochemistry

P104 THE RELATIONSHIP BETWEEN SERUM ANTI-CARBONIC ANHYDRASE I AND II ANTIBODIES AND INTRAOCULAR PRESSURE

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Background: Carbonic anhydrase (CA) enzyme catalyzes the hydration of carbon dioxide to form bicarbonate and hydrogen ions. In the ciliary body of the eye, this reaction is resulted in aqueous humor secretion into the posterior chamber. Many CA isoenzymes have been described up to now. CA-I isoenzyme is present in various epithelium, and its activity is much lower than CA-II isoenzyme's. CA-II is functioned in the cytoplasm of the cells. In this study we focused on the relationship between two antibodies of CA isoenzymes (anti-CA-I and anti-CA-II) and intraocular pressure.

Methods: Forty-eight subjects were enrolled in this study. After detailed ophthalmic examination, intraocular pressure (IOP) of their randomized selected eye was noted and serum anti-CA-I and CA-II antibodies were analyzed by ELISA. Subjects were divided two groups: Group 1 had low serum levels of antibodies and Group 2 had high serum levels of antibodies. IOP differences of the groups and correlation between serum levels of antibodies and IOP measurements were investigated statistically.

Results: Mean serum anti-CA-I levels were 0.192 ± 0.059 ABSU in Group 1, compared to 0.474 ± 0.239 ABSU in Group 2. Mean serum anti-CA-II levels were 0.3 ± 0.133 and 0.438 ± 0.227 ABSU, respectively. Mean IOP measurements were 14.68 ± 2.38 and 15.48 ± 2.79 mmHg, respectively. While the differences in anti-CA-I and anti-CA-II levels were statistically significant ($p < 0.0001$, $p = 0.016$ respectively), there was no significant differences in IOP measurements for two groups ($p = 0.291$). The correlations between anti-CA-I and anti-CA-II antibodies and IOPs were also not significant ($r = -0.012$, $p = 0.937$; $r = 0.085$, $p = 0.567$ respectively).

Conclusion: This is the first time in the literature that the correlation between anti-CA-I and CA-II antibodies and IOP levels has been studied. Serum levels of CA-I and CA-II antibodies exhibited no significant correlation toward the IOP measurements. Future wider-ranging studies may more clearly reveal the role of anti-CA-I and CA-II antibodies in IOP regulation.

Laboratory Methods: Pharmacology

P105 EVALUATION OF TOXICITY OF ANTI-GLAUCOMA DRUGS USING STRATIFIED HUMAN CULTIVATED CORNEAL EPITHELIAL SHEETS

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Background: Because glaucoma patients received anti-glaucoma drugs for many years, the assessment of safe profiles of anti-glaucoma drug is important. In the present study, we investigated the toxicity profiles of seven anti-glaucoma drugs and benzalkonium chloride (BAC) using the stratified human cultivated corneal epithelial sheets in serum-free culture system.

Methods: The stratified human cultivated corneal epithelial sheets in serum-free culture system were exposed to seven antiglaucoma drugs in their commercial presentation [Latanoprost® (Nitten), LatanoprostPF® (Nitten), TravatanZ® (Alcon), Tapros® Santen), Xalatan® (Pfizer), DuoTrav® (Alcon), Xalacom® (Pfizer)] and two concentrations (0.002% and 0.02%) of BAC. Each solution was applied on the cell sheets for 10 minutes. The cell proliferative capacity and barrier function were examined by WST-1 and carboxyfluorescein permeability assays. Further, histological evaluation of cell sheets were also performed.

Results: Xalatan®, Xalacom® and 0.02% BAC resulted in significantly lower cell proliferation capacity and barrier function than control ($p < 0.05$), but the others did not show significant difference. Cell sheets with 1 hour, 6 hours and 24 hours applications of Xalatan®, Xalacom® and 0.02% BAC were more damaged histologically than the others.

Conclusions: Xalatan®, Xalacom® and 0.02% BAC have high toxicity *in vitro*, whereas Latanoprost®, LatanoprostPF®, TravatanZ®, Tapros®, DuoTrav® and 0.002% BAC show little toxicity. This confirms that higher concentrations of BAC were responsible for its toxicity. Our assays using the stratified human cultivated corneal epithelial sheets in serum-free culture system are promising methods in ophthalmic toxicology.

P106 EFFECTS OF OCIMUM BASILICUM SEED EXTRACT ON STEROID-INDUCED GLAUCOMA IN RABBITS

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Background: *Ocimum basilicum*, a herb with known medicinal properties was investigated for its intraocular pressure lowering effects in steroid-induced rabbit model of glaucoma. The extract has previously been shown to possess anticholinesterase, antihypertensive and antioxidant properties.

Methods: Three concentrations of *Ocimum basilicum* seed extract (0.25, 0.5 and 1% w/v) were evaluated for intraocular pressure lowering effect in normotensive rabbits. Thereafter, the concentration showing maximum intraocular pressure

lowering from baseline was chosen for evaluation in steroid-induced oculohypertensive rabbits. Timolol 0.5% was used as reference standard.

Results: Unilateral instillation of *Ocimum basilicum* seed extract (0.25%) to normotensive rabbit eye resulted in a mean peak IOP reduction of 16.84% from baseline. The 0.5 and 1% concentrations resulted in a maximum mean IOP reduction of 22.66 and 23.10% respectively. The IOP reduction caused by OBE 0.5 and 1% did not differ significantly from each other ($p > 0.05$) but a significant difference was observed between mean IOP reduction with OB 0.25% versus 0.5% ($p < 0.05$) and OBE 0.25% versus 1% ($p < 0.01$). Therefore, 0.5% concentration was chosen for further evaluation in animals with experimentally elevated intraocular pressure. Unilateral single drop application of *Ocimum basilicum* seed extract in steroid-induced glaucomatous eye resulted in a mean peak IOP reduction of 26.43% from baseline, 2 hours postinstillation as compared to 32.60% by timolol at the same time point. The intraocular pressure reduction caused by *Ocimum basilicum* extract was comparable to that caused by timolol for the first 4 hours. Timolol induced significant intraocular pressure reduction lasted for 8 hours whereas that caused by *Ocimum basilicum* extract lasted for a total of 5 hours. Peak intraocular pressure reduction was achieved 2 hours postinstillation with both the timolol and *Ocimum basilicum* extract and was not significantly different from each other.

Conclusions: *Ocimum basilicum* seed extract showed significant intraocular pressure lowering effect however, its utility as effective antiglaucoma medications needs further investigations.

P107 THE EFFECTS OF PROSTAGLANDIN ANALOGUES ON ISOLATED RABBIT CILIARY ARTERIES

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Background: It has been reported that various prostaglandin (PG) analogues can increase ocular blood flow. However, underlying mechanism has not been determined. To evaluate the pharmacology of tafluprost, latanoprost, unoprostone, bimatoprost, travoprost and PGF₂ α on vascular smooth muscle, we have investigated the effect of these agents on isolated rabbit ciliary artery in vitro.

Methods: Under the dissecting microscope, ciliary arteries were prepared from albino rabbit eyes and mounted in a myograph system. After ciliary arteries were pre-contracted with high K solution, the effects of PG analogues to ciliary arteries were investigated using isometric tension recording methods. The amplitude of contraction induced by high-K solution was defined as 100%.

Results: Tafluprost ($n = 16$), latanoprost ($n = 12$), unoprostone ($n = 11$) and travoprost ($n = 20$) induced dose-dependent relaxations in rabbit ciliary arteries pre-contracted with high-K solution and the relaxation achieved at 30 μ m was $69 \pm 19\%$, $70 \pm 17\%$, $70 \pm 18\%$, $68 \pm 16\%$ respectively. Application of N⁹-nitro-L-arginine methylester (L-NAME) (100 μ m) or indomethacin (10 μ m) did not affect these relaxations in rabbit ciliary arteries. For bimatoprost ($n = 20$), and PGF₂ α ($n = 16$), the relaxation achieved at 30 μ m was $8.8 \pm 11\%$, $12 \pm 13\%$, which was significantly smaller than other PG analogues. L-NAME or indomethacin also did not affect their amplitude of relaxation.

Conclusions: All PG analogues and PGF₂ α induced dose-dependent relaxations in rabbit ciliary artery. The mechanism may not be dependent on NO or intrinsic PG production. Bimatoprost and PGF₂ α had smaller effect than other PG analogues.

P108 THE EXPRESSION OF PROSTANOID RECEPTOR SUBTYPE, ENOS BY PROSTAGLANDIN ANALOGUE IN HUMAN UMBILICAL VEIN ENDOTHELIAL CELLS (HUVEC) AND CORD SMOOTH MUSCLE CELLS (cSMC)

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Background: This study is to shed light on the possibility that the ocular blood flow increment can be caused by prostaglandin analogue (Latanoprost, Travoprost, Bimatoprost) through relaxation of ocular blood vessel.

We evaluated the expression of vasodilating factors by prostaglandin analogue in human umbilical vein endothelial cells (HUVEC) and cord smooth muscle cells (cSMC).

Method: We used HUVEC and cSMC. After dilution of respective Latanoprost, Travoprost, and Bimatoprost to three different quantities, such as 1 μ m, 10 μ m, and 100 μ m each, we applied these drugs on HUVEC and cSMC to observe DNA expression of vasodilator receptor (EP₂, EP₄, IP, DP) and eNOS which is associated with the expression of Nitric Oxide (another vasodilator) by means of RT-PCR.

Results: All of the these drugs increased EP₄ receptor and eNOS DNA expression in HUVEC. Among them, the effect of Latanoprost was the most conspicuous. On the other hand, TP, FP receptor DNA expression also increased in cSMC, but the amount of expression was not as high as in HUVEC.

Conclusion: We conclude that the net effect of these phenomena point towards the possibility of ocular blood flow increment through increased vessel dilation. We also expect the result of our study will help inspire new therapeutic development of prostaglandin analogue on normal-tension glaucoma.

P109 PHARMACOLOGICAL UTILITY OF YAG-LASER INDUCED RABBIT MODEL OF GLAUCOMA

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Background: In order to study the pathophysiological mechanisms of glaucoma and in new drug development continuous efforts are being made to develop animal models that can easily provide elevation of intraocular pressure (IOP) and resemble the human disease as closely as possible. This study was done to evaluate the pharmacological utility of Nd-YAG laser induced rabbit model of glaucoma.

Methods: Eight adult pigmented rabbits of either sex, weighing from 2.5-3.5 kg, were used. Both eyes of each rabbit were exposed to neodymium-yttrium aluminum garnet (Nd-YAG) laser. The rabbit was placed in front of slit lamp, which was attached to an articulated arm of the Nd-YAG. Ketamine hydrochloride (20 mg/kg) was administered intramuscularly, 10 min before laser irradiation. The trabecular meshwork was ablated internally via a gonioscopy lens. Ablation of the pos-

terior trabecular meshwork was achieved as the laser beam was directed at the posterior trabecular meshwork and iris root. Both eyes received 100-150 laser pulses (5-10 mj) into the anterior chamber. The IOP estimations were done 30 min post laser and daily thereafter for 6 weeks. The rabbits not showing a rise in IOP were subjected to YAG-laser irradiation again after 15 days.

Results: Immediately after exposure to laser all rabbit eyes showed pigment dispersion due to damage to pigmented trabecular cells and one of the eye showed hyphema due to disruption of blood vessels. Following laser exposure, all 16 eyes showed a gradual fall in IOP over next 5 days with maximum reduction of 25.66% from baseline IOP observed on 3 day post laser treatment. From day 7 onwards 5 out of 16 eyes showed a gradual increase in IOP while the remaining 11 eyes maintained the baseline IOP. These 11 eyes not showing rise in IOP were once again subjected to laser treatment 15 days after 1st laser treatment. The similar pattern of fall in IOP over next 5 days was observed again with a mean reduction of 27.83% on day 3. From day 7 onwards out of 11 rabbit eyes, 7 eyes showed a gradual increase in IOP while the remaining 4 maintained the baseline IOP. The IOP of control group rabbit eyes was also observed at the same time points and did not show a significant change at any time point during the entire period of observation. All eyes showing increase in IOP maintained elevated IOP more than 60% above baseline from 21 -44 days post-laser. Unilateral instillation of timolol 0.5% resulted in maximum mean IOP reduction of 29.45% from baseline at 2 hr post treatment. Significant IOP lowering lasted from 1-6 hr postinstillation.

Conclusions: Nd-YAG laser irradiation to pigmented rabbit eyes resulted in a sustained high intraocular pressure as a result of late scarring. This rabbit model was responsive to timolol instillation and can be utilized for pharmacological evaluation of potential antiglaucoma drugs.

P110 IOP IN OCULAR NORMOTENSIVE RABBITS FOLLOWING RECOMBINANT HUMAN INSULIN-LIKE GROWTH FACTOR-1 ADMINISTRATION

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Background: Several macromolecules have been evaluated as ocular hypotensive agents with promising potency in some cases. However, optimizing dosing and route of administration parameters is still challenging while toxicity to retina and corneal endothelium remains a major concern. Attempts to study the merits of insulin like growth factor 1 (IGF-1) were discontinued in the past as supraphysiologic levels of IGF-1 produced diabetic-like retinal microangiopathy. The present study aims at investigating the effect of relatively moderate and safe doses of IGF-1 on IOP.

Methods: The present study comprises local ocular rhIGF-1 (Tercica Inc.) interventions in ocular normotensive, 2-2.5 kg, male albino rabbits. 3 routes of administration were investigated utilizing 3 pairs of 6 treated and 6 control animals. Treated and control animals received local dose to the right eye of 50 µl of rhIGF-1 (500 ng/µl) or balanced salt solution, respectively, 3 times per week. The intervention was done through intrascleral injection (1 mm away from upper limbus), corneal intrastromal injection (in upper cornea, 2 mm away

from limbus), or through controlled topical administration on central cornea (via 5 mm cylinder placed on central cornea) for 1st, 2nd, and 3rd intervention groups respectively. End points were IOP (Tonopen AVIA, Reichert) and central corneal thickness (CCT) (SP 100, Tomey) at the end of the 9th week.

Results: Intrastromal administration achieved best scores as IOP of the rhIGF-1 treated group (5.17 ± 0.98 mmHg) was significantly lower than baseline (8.17 ± 0.75 ; $p = .0039$) and control group (7.83 ± 0.75 ; $p = .0039$). For intrascleral administration, IOP of the rhIGF-1 treated group (6.5 ± 1.05) was also significantly lower than baseline (8.5 ± 0.55 ; $p = .0082$) and control group (8.83 ± 1.17 ; $p = .0131$). Topical corneal intervention scored least ocular hypotensive effect, as IOP of the rhIGF-1 treated group (7.17 ± 1.17) was significantly lower than baseline (8.67 ± 0.82 ; $p = .0453$) but with non-statistically significant difference from control group (8.5 ± 0.84 ; $p = .0656$). Although 9th week CCT measurements in intrastromal group showed slight increase over baseline, differences were still non-statistically significant, as was the case with other 2 groups.

Conclusions: The superiority in IOP-lowering effect of intrastromal over topical rhIGF-1 reflects relatively poor penetration of rhIGF-1 through the intact cornea. Although intrascleral rhIGF-1 administration promises better availability at presumed target tissues the results suggest relatively limited diffusion from site of injection toward target tissues.

Laboratory Methods: Immunobiology

P111 THE ASSOCIATION BETWEEN *HELICOBACTER PYLORI* INFECTION AND INTRAOCULAR PRESSURE IN ANTERIOR UVEITIS PATIENTS

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Purpose: To investigate the association between *Helicobacter pylori* infection and intraocular pressure (IOP) in anterior uveitis patients.

Methods: In a prospective study, the first diagnosed patients with anterior uveitis were included. And, they were divided into high IOP group (IOP ≥ 21 mmHg) and normal IOP groups based on intraocular pressure. The subjects with history of treatment that could affect the intraocular pressure or history of any previous intraocular surgery were excluded from the study. 64 uveitis patients with high intraocular pressure (IOP) and 96 uveitis patients with normal IOP were enrolled. Serum samples from all subjects were analyzed for the presence of disease specific antigens or antibodies such as *Helicobacter pylori* (*H. pylori*), *Varicella zoster virus* (VZV), herpes simplex virus (HSV), human leukocyte antigen (HLA) B27, anti-nuclear antibody (ANA), rheumatoid arthritis (RA) and Toxoplasmosis. The positive rate of each serology was compared between high IOP group and normal IOP group.

Results: The positive rate of *H. pylori* was 70.3% in high IOP

group and 46.9% in normal IOP group ($p < 0.001$). Normal IOP group had significantly more positive serologic results of VZV ($p < 0.001$), HSV ($p < 0.001$), HLA B27 ($p = 0.001$). However, there was no significant difference of positive serologic result of ANA ($p = 0.535$), RA ($p = 0.766$) and toxoplasmosis ($p = 0.189$) between two groups. The severity of uveitis was not associated with intraocular pressure. Each detailed results were summarized in table 1.

Conclusions: *H. pylori* infection was significantly associated with high IOP in anterior uveitis patients. However, VZV, HSV and HLA B27 were associated negatively. This study suggests that *H. pylori* may play a role in the elevation of IOP and probably, it might be due to affect outflow facility on trabecular meshwork.

Laboratory Methods: Pharmacogenetics

P112 PTGFR GENE: A POTENTIAL CANDIDATE GENE FOR GLAUCOMA AND PHARMACODYNAMIC GENE IN MALAYSIAN POPULATION

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Purpose: To determine the association of *PTGFR* between glaucoma patients and healthy controls and to determine the role of *PTGFR* in responsiveness to topical latanoprost

Methods: A prospective cohort study was conducted on 90 OAG patients; 45.6% of them were treated with latanoprost as monotherapy and 54.4% were on adjunctive therapy. They were followed up for 12 months with IOP measurement taken 3 monthly. Ninety age-matched of healthy controls were also recruited. Venesection was done and 3 ml of blood was obtained for genotype. DNA extraction was done using commercially available kit. PCR was conducted and direct sequencing of the whole gene including the 3000bp upstream from exon 1 region was conducted to identify the sequence variants of *PTGFR*. Two microsatellite instability was also detected in intron 3.

Results: Topical latanoprost 0.005% provided pressure lowering effect of 7.08SD4.17 (mean percentage of 27.05SD19.28) and without significant different between monotherapy and adjunctive therapy ($p = 0.774$). There was significant reduction of IOP from the baseline based on repeated measures ANOVA. rs4650581 ($p = 0.005$), rs34012237 ($p = 0.045$) and rs3766335 ($p = 0.005$) found in introns 3 of *PTGFR* gene was significantly associated with pressure lowering effect of latanoprost. Homozygous mutant was found to associate with poor pressure lowering effect. There was significant association of *PTGFR* gene with susceptibility of glaucoma with odd ratio of 5.2 of rs1116504 to develop glaucoma, while homozygous wild rs1116505 has protective effect against glaucoma.

Conclusion: *PTGFR* is potential candidate gene for OAG in Malaysian population. *PTGFR* is a strong predictor to determine the response to latanoprost.

Laboratory Methods: Proteomics

P113 PROTEOME ALTERATIONS IN PRIMARY OPEN-ANGLE GLAUCOMA AQUEOUS HUMOR

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Being a nourishment and scavenging source for most of the anterior and posterior chamber tissues, the aqueous humor represents one of the main risk factors for glaucoma. The aim of our study is to investigate the yet unexplored relationship between aqueous humor protein content and open-angle glaucoma (POAG) pathogenesis. Aqueous humor was collected from 10 POAG patients (cases) and 14 senile cataract patients (controls), matched for age and gender, undergoing surgery for trabeculectomy and cataract, respectively. Protein samples were cyanine-labeled and hybridized with antibody microarrays. Microarray signals were revealed by laser scanner, quantified, and compared by statistical analyses. Total protein amounts were not significantly different in patients versus controls. Conversely, a proteome cluster significantly modified in patients as compared to controls was identified as highly predictive for disease status. Selected proteins underwent dramatic variation, which was correlated to pathogenic events characterizing POAG, including oxidative damage, mitochondrial damage, neural degeneration, and apoptosis. The results obtained indicate that proteomic analysis of aqueous humor is a new tool for POAG diagnosis in case of otherwise uncertain disease recognition. Furthermore, this study allows a better understanding of mechanisms involved in the pathogenesis of POAG.

Laboratory Methods: In-vivo Imaging – Posterior Segment

P114 RETROGRADE AND WALLERIAN AXONAL DEGENERATION OCCUR SYNCHRONOUSLY IN AXOTOMIZED RETINAL GANGLION CELLS

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Background: Axotomy of retinal ganglion cells (RGC) causes cell death by apoptosis and induces Wallerian (orthograde) and retrograde axonal degeneration. Confocal scanning laser ophthalmoscopy (CSLO) has been used to assess RGC soma loss after optic nerve transection. We combined a dual laser CSLO with a diode-pumped solid-state (DPSS) laser to assess the time course of RGC axonal and soma loss after intraretinal axotomy in the rat *in vivo*.

Methods: A 532 nm DPSS laser was mounted on an aluminum optical breadboard positioned in front of the CSLO telescope lens. Using a 30/70 beam splitter, the 532 nm DPSS laser spot was imaged on the retina while RGC axon bundles were visualized with the 488 nm CSLO laser. At

various times after application of DPSS laser burns, the following were quantified: (1) Axonal loss, measured by red-free imaging or CMFDA labeling (Kanamori et al., IOVS, *in press*); (2) the size of the laser burn at the nerve fiber and RPE layers; (3) counts of RGC somas retrogradely labeled with DiR at 300 μ m and 900 μ m away from the edge of the laser lesion.

Results: DPSS laser burns resulted in reproducible axon loss distal and proximal to the site of injury. Axonal loss and the size of the laser lesion correlated with the duration of the burn. Axonal loss was complete at 3 weeks after intraretinal axotomy and could be confirmed by immunostaining retinal whole mounts for neurofilaments. Imaging of CMFDA labeled axons demonstrated Wallerian degeneration distal to the laser burn.

Conclusions: Intraretinal axotomy by DPSS laser combined with multilaser CSLO imaging can be used to study the kinetics of RGC soma loss and axon loss degeneration.

P115 IN-VIVO EVALUATION OF THICKNESS CHANGES OF RETINAL LAYERS AND RETINAL GANGLION CELLS AFTER INTRAVITREAL INJECTION OF ENDOTHELIN-1 IN RAT EYE

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Background: To examine the relationship between the retinal injury after an intravitreal injection of endothelin-1 (ET-1) and the amount of ET-1 in the rat eye.

Methods: Male Brown-Norway rats, 10 weeks of age and weighing 200 to 250 g, were used. A single intravitreal injection of ET-1 (0.2, 2.0, 20, or 200 pmol/eye; Peptide Institute, Osaka, Japan) was performed in one eye (n=7, 8, 6, 6). Contralateral eyes were served as control. An experimental optical coherence tomography (OCT) system was developed with a time-domain OCT (EG SCANNER, Microtomography Corp., Japan). Optical components in the experimental OCT system were optimized to acquire retinal images in rat fundus (Nagata A, et al. IOVS 2009). Cross-sectional OCT imaging of the retina was performed in a circumpapillary fashion, with a circle diameter of 500 μ m centered on the optic disc at baseline and 2 weeks after an intravitreal injection of ET-1 under general anesthesia with intraperitoneal pentobarbital. Measurements were recorded for total retinal thickness, retinal nerve fiber layer (RNFL) thickness, and inner retinal thickness (from RNFL to inner nuclear layer). Afterwards RGCs were labeled with fluorogold applied to the superior colliculus. Seven days later, the rats were euthanized with overdose pentobarbital, and their retinas were prepared as flatmounts for examination under fluorescence microscopy to count RGC survival.

Results: Total retinal thickness, RNFL thickness and inner retinal thickness at baseline were 206.0 \pm 5.1 μ m, 27.8 \pm 2.4 μ m, 94.5 \pm 3.3 μ m (mean \pm SD), respectively. No significant changes in any retinal layers were observed in eyes after injection of ET-1 (0.2 or 2.0 pmol/eye) during the experimental period. ET-1 at the amount of 20 or 200 pmol/eye caused a significant decrease of total retinal thickness, RNFL thickness and inner retinal thickness (20 pmol: total retinal thickness, 178.4 \pm 2.1 μ m, 86.4 \pm 3.2%; RNFL thickness, 21.3 \pm 1.7 μ m, 81.5 \pm 7.8%; inner retinal thick-

ness, 56.9 \pm 3.7 μ m, 60.7 \pm 4.6%; 200 pmol: total retinal thickness, 182.2 \pm 7.8 μ m, 90.2 \pm 3.0%; RNFL thickness, 22.7 \pm 1.9 μ m, 84.3 \pm 6.9%; inner retinal thickness, 59.3 \pm 7.9 μ m, 64.3 \pm 7.5%). Total retinal thickness, RNFL thicknesses and inner retinal thickness in OCT images correlated significantly with the number of retrogradely labeled RGCs (total retinal thickness, r = 0.85; RNFL thickness, r = 0.84; inner retinal thickness, r = 0.91, P < 0.001 each).

Conclusion: An intravitreal injection of ET-1 at the amount of 20 pmol/eye or greater caused a significant decrease of inner retinal thickness of the rat eye. The number of fluorogold labeled RGCs was well correlated with inner retinal thickness in OCT images. Inner retinal thickness measured by OCT is a useful in vivo marker of RGC injury in this model.

P116 UTILITY OF THE MEASUREMENT OF GANGLION CELL COMPLEX BY OCT IN THE EARLY DIAGNOSIS OF GLAUCOMA

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Objective: Report a 43 male with pigmentary dispersion syndrome and ocular hypertension who has failed medical therapy and IOP fluctuation between 30 to 40 mmHg. Structural measurements with HRT3 and FD-OCT (Fourier – Domain OCT 3000 RS Nidek Technologies) evidence cupping and reduction in the normal thickness of the retinal nerve fiber layer despite the functional studies (visual Fields, SWAP, FDT) are within normal limits.

Method: A review of a clinical case of a patient of 43 years with pigment dispersion syndrome and ocular hypertension greater in the right eye, treated with iridotomy bilateral iridoplastia and maximum hypotensive drugs (prostaglandin analogue, beta-blocker and carbonic anhydrase inhibitor) without adequate control of intraocular pressure, follow up using Visual Fields (Humphrey 24-2, SWAT, FDT), structural test HRT (Heidelberg Retinal Tomograph) and (FD Fourier Domain OCT).

Results: Evident decrease in thickness of the Ganglionar Cell Complex in the inferior temporal peripapillary zone using F-D OCT in the right eye. HRT3 progressive deepening with right eye neural rim volume decrease. The functional studies (visual Fields, SWAP, FDT) are within normal limits.

Conclusion: The detection of decrease in the thickness of Ganglionar Cell Complex through FD-OCT could be a useful parameter for detecting earlier glaucomatous changes, this also supported by rating systems of HRT3 as GPS and MRA, would complete a powerful diagnostic arsenal to detect early glaucoma.

Laboratory Methods: In-vivo Imaging – Anterior Segment

P117 CONJUNCTIVAL CHARACTERISTICS IN PRIMARY OPEN-ANGLE GLAUCOMA AND MODIFICATIONS INDUCED BY CANALOPLASTY: AN IN-VIVO CONFOCAL MICROSCOPY STUDY

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Background: To evaluate the microscopic epithelial features of the superior bulbar conjunctiva assessed with in vivo confocal microscopy (IVCM) in glaucomatous patients undergoing canaloplasty.

Methods: Sixteen eyes of 16 consecutive Caucasian patients with uncontrolled primary open-angle glaucoma (POAG) undergoing canaloplasty were enrolled. Eyes were examined using digital confocal laser-scanning microscopy (HRT III Rostock Cornea Module) at baseline and after 12 weeks. The mean microcyst density (MMD: cysts/mm²) and microcyst area (MMA: μm^2) were considered.

Results: Before surgery, the mean intraocular pressure (IOP) was 28.25 ± 9.39 mmHg. MMD and MMA were 10.34 ± 8.58 cysts/mm² and 2109.43 ± 1803.87 μm^2 , respectively. After canaloplasty, the mean IOP was 13.06 ± 4.82 mmHg; both MMD and MMA increased compared to baseline, with values of 37.86 ± 21.4 cysts/mm² and 11997.84 ± 8630.35 μm^2 , respectively.

Conclusions: Conjunctival epithelial microcysts were evident in glaucomatous eyes under medical therapy prior to canaloplasty. The microcyst density and surface of the superior bulbar conjunctiva increased after canaloplasty, which may be indicative of postsurgical enhancement of aqueous filtration across the conjunctiva.

P118 ULTRASOUND BIOMICROSCOPY AS A USEFUL TOOL IN DEFINING THE PATHOGENESIS OF RECURRENT, ALTERNATING LATE HYPOTONY

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Background: To present an unusual case with recurrent, alternating, late hypotony attacks in a patient with pseudoexfoliative glaucoma treated by phacotrabeculectomy and mitomycin C.

Methods: A 70-years old woman was operated for medically uncontrolled pseudoexfoliative glaucoma and cataract during 4 years of follow-up. 0.2 mg/ml mitomycin C was used in 2 minutes duration during both two-site phacotrabeculectomy. After 12 months of the first operation and 17 months after the second operation, the patients presented with alternating hypotony attacks. The Seidel test was negative for both eyes in all examination periods. The first operated eye was asymptomatic other than the low intraocular pressure resolving spontaneously, while the latter had deteriorated despite medical therapy. The surgical interventions we performed were paracentesis, intracameral viscoelastic injection, posterior subtenon triamcinolone injection and diod laser photocoagulation as single spot in each of 4 quadrants. The Ultrasound Biomicroscopy (UBM) were performed during and after the treatment of hypotony attacks. The UBM images during attacks showed that there were hypoechogenic areas in corpus ciliaris tissue at pars plana region resembling fluid lakes. There were no classical appearance of cilio-choroidal detachment.

Results: After treatment, all findings on UBM images were

resolved and intraocular pressure was within normal range during follow up of 6 months.

Conclusion: Recurrent, alternating hypotony attacks can be seen after surgery for glaucoma. Late hypotony can be attributed to variety of pathogenetic factors such as bleb leakage, mitomycin C toxicity, ciliary shut-down, cilio-choroidal detachment. In our patient, when UBM images with fluid accumulation within the ciliary body and choroidea tissues were taken into consideration, the increased uveo-scleral outflow may cause hypotony. Mitomycin C toxicity or pseudoexfoliation may be a responsible factor for transient, increased uveo-scleral outflow. UBM may be considered as a useful tool in defining the pathogenesis of hypotony.

P119 A PROSPECTIVE ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY EVALUATION OF CHANGES IN ANGLE AFTER LASER IRIDOTOMY IN INDIAN EYES

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Background: Primary angle-closure glaucoma (PACG) accounts for the major chunk of visual morbidity from glaucoma in developing countries like India and China. The destructive nature of the asymptomatic form of the disease demands an early detection of anatomically narrow angles by accurate assessment of the anterior chamber angle (ACA) and subsequent prevention of visual loss from PACG by subjecting the patient to appropriate treatment modality. The purpose of this study was to prospectively quantify changes in anterior segment morphology after laser iridotomy using gonioscopy and anterior segment OCT (AS OCT) in Indian eyes. Prospective comparative observational case series.

Methods: Subjects ≥ 30 years diagnosed as primary angle closure and who subsequently underwent laser iridotomy were included in the study. Each subject underwent history taking, refraction, slit lamp examination, applanation tonometry, gonioscopy and ASOCT imaging (RTVue 100) before laser peripheral iridotomy (LPI). The gonioscopy and OCT imaging was again performed one week post LPI. Outcome Measures: The anterior chamber angle (ACA) in a particular quadrant was classified as closed if the posterior trabecular meshwork could not be seen on gonioscopy. A closed ACA on AS OCT imaging was defined by the presence of any contact between the iris and angle wall anterior to the scleral spur. Additional parameters studied in the AS OCT images were: Angle opening distance at 500 μm AOD(500), Angle recess area at 500 μm and Trabeculo-Iris space area at 500 μm (TISA 500 μm). ACA width was graded in four quadrants according to the Spaeth's grading system by using the Posner IV mirror gonioscopic prism. These grades were further scored from 0 to 4 for statistical analysis. Statistical analyses between Pre and Post LPI visits were performed by using paired student t test. p value < 0.05 was considered statistically significant.

Results: Seventy eight eyes of 40 patients were enrolled in the study of which there were 14 males (35%) and 26 females (65%). Mean age was 54.75 ± 11.15 years (Range 25 – 74 years) Gonioscopy grades increased from 1.18 ± 1.03 to 2.68 ± 1.06 superiorly, 1.16 ± 0.78 to 2.55 ± 1.05 inferiorly, 0.84 ± 0.43 to 2.87 ± 0.66 temporally and 1.61 ± 0.91 to $3.05 \pm$

1.16 nasally pre and post LPI respectively.. ASOCT showed the changes in angle width from 17.7 ± 7.4 to 30.3 ± 7.8 (P = 0.002), TISA500 ($\times 10^{-2} \text{ mm}^2$) from 4.9 ± 1.2 to 14.4 ± 2.6 (P = 0.001), AOD (μm) from 162.9 ± 47.8 to 275.6 ± 79.8 (P = 0.001), and ARA ($\times 10^{-2} \text{ mm}^2$) from 1.6 ± 0.1 to 8.2 ± 6.6 (P = 0.000) pre and post LPI respectively.

Conclusion: Our OCT images showed LPI-induced changes in angle parameters agree well with gonioscopic angle opening even in Indian Eyes and hence anterior segment OCT can serve as an objective alternative for ACA assessment in angle-closure glaucomas with minimal significant variability.

P120 IN-VIVO IMAGING OF THE AGE RELATED CHANGES OF THE TRABECULAR PATHWAY USING ANTERIOR SEGMENT FOURIER-DOMAIN OCT

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Background: If the modifications occurring in the trabecular meshwork (TM) and Schlemm's canal (SC) related to glaucoma differ from those solely occurring from the aging process is a long standing controversy. As a result of the technical challenges of histological studies and the limited resolution capacity of previous imaging technologies, most of our current understanding of this pressure dependent pathway comes from enucleated human eyes and animal models. Furthermore, the anatomy and physiology of the collector channels (CC) has remained poorly understood; at the present time, it is not known if pathologic processes occur at or affect these structures. Age related modifications occurring in the structures comprising the TM pathway have never been studied *in vivo* in the human eye. The aim of this study is to quantitatively and qualitatively describe the age related modifications of SC, the TM and the CC in normal eyes using anterior segment Fourier domain optical coherence tomography (ASDOCT).

Methods: Three normal subjects per decade of life (N=24, range: 10-90 years) were imaged at the right temporal or nasal limbus using a standardized protocol of sequential scans. When a CC was identified, 3 radial and 3 longitudinal scans were performed. The scans imaging the SC-CC junction were selected for the analysis and were also qualitatively evaluated by a masked investigator. The structures assessed in the radial scans included: SC cross sectional area, maximum width and length; TM mean thickness; CC diameter; ostium diameter; and the diameter of the vessels corresponding to the intrascleral plexus. The longitudinal scans were evaluated for the maximum and minimum width of SC in a 500 μm section.

Results: Using Pearson's correlation coefficients (r) a significant negative correlation (all $p < 0.001$) was found for all the variables (SC area $r = -0.81$, SC length $r = -0.75$, SC width $r = -0.80$, SC longitudinal minimum width $r = -0.80$, SC maximum longitudinal width $r = -0.67$, CC diameter $r = -0.81$, ostium diameter $r = -0.61$, vascular plexus diameter $r = -0.70$, TM Thickness $r = 0.56$), with the exception of the mean TM thickness. In the first four decades of life, the structure remain majorly unchanged; SC averages 9,000 μm^2 and appears elliptical in shape, with a length of $> 2/3$ of the total TM length,

structure in which the flow may occur homogeneously. Visible modifications of the structures appear in the early 40's: SC shortens and acquires a triangular shape; the TM presents areas of preferential flow. As the aging process continues, SC is not only reduced in dimensions, but becomes increasingly tortuous. Circumferential flow may be reduced firstly (7th decade), while vertical flow in the area near CC persists throughout the life of the individual.

Conclusions: The anatomy of the TM pathway can be studied using ASDOCT. Age related modifications in the structures comprising the TM pathway begin early in the 5th decade of life. SC undergoes a change in configuration, rather than a simple loss of lumen. The CC are affected with a similar reduction in dimensions. Future studies comparing these structures in normal and glaucomatous eyes should take into consideration the observations derived from this study.

P121 DEEP-SCLERECTOMY VERSUS TRABECULECTOMY: OUTFLOW AND CONJUNCTIVAL RESPONSE

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Background: Deep-sclerectomy (DS) has a better safety profile than trabeculectomy. Limited understanding of drainage mechanisms may contribute to its poor uptake. We compare anterior segment-OCT (AS-OCT) morphology of DS to trabeculectomy, with the aim to understand drainage mechanisms.

Methods: DS, trabeculectomy and medically controlled glaucoma patients were scanned with the Visante AS-OCT. Four-quadrant high-resolution scans were centered on the scleral flap in surgical patients and the superior sclera in controls. AS-OCT parameters were examined for association with success (IOP ≤ 16 mmHg without hypotensive agents). Conjunctiva/Tenon's layer thickness was measured in controls.

Results: Eighteen DS, seventeen trabeculectomy and fifteen controls were examined. Patient age and glaucoma type were similar. A bleb cavity (BC) was more frequent in trabeculectomy than DS (64.7% vs. 22.2%, $p = 0.0176$). Total height and bleb wall (BW) thickness was greater in trabeculectomy (699.4 vs. 418.9 μm , $p = 0.0045$ and 604.1 vs. 418.9 μm , $p = 0.01$). BW cysts were equally present (50% vs. 52.9%, $p = 1$). Control conjunctiva and Tenon's thickness (203.3 μm) was not associated with IOP ($r = 0.13659$, $p = 0.6274$). In successful DS, total height (586.7 vs. 251.1 μm , $p = 0.0003$), wall thickness (586.7 vs. 251.1 μm , $p = 0.0003$) and intrascleral lake (IL) height (513.3 vs. 361.1 μm , $p = 0.0271$) was greater than non-successful cases. Trabeculo-Descemet's membrane (TDM) thickness was not associated with success. Successful trabeculectomy procedures were taller and had thicker wall than non-successful cases (817.3 vs. 483.3 μm , $p = 0.0207$, 670 vs. 483.3 μm , $p = 0.1074$). BC was taller in successful trabeculectomy eyes (607.5 vs. 176.7 μm , $p = 0.0412$).

Conclusions: The IL is a reservoir in DS, analogous to trabeculectomy BC. IL and BC heights are associated with surgical success, suggesting drainage via the TDM in DS and the sclerostomy in a trabeculectomy are equally important. In trabeculectomy, higher levels of aqueous outflow result in BC formation, thicker BW and taller blebs. Low-flow drainage

procedures such as DS result in a lower bleb height and rare BC formation.

P122 THE MORPHOLOGY OF FILTRATION BLEB BY CONFOCAL LASER MICROSCOPY

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Objective: To describe the findings of microscopy confocal laser and the relation with the morphology of the filtration bleb.

Methods: Studied 100 eyes to which accomplished confocal microscopy laser with the HRT II and the Rostock's corneal module. The MC's Nernst test was applied for statistical significance to $p = 0.05$.

Results: Most cases were between 61 and 80 years (55.8%) and white color of skin (46.8%). In the group of more than 30% IOP reduction was located the biggest quantity of blebs of all the sizes. The medium size blebs ($n = 24$; 55.8% of cases) match with the most IOP reduction ($p = 0.00$), followed by the small one ($p = 0.14$). The flattened blebs accounted for 55% of cases ($p = 0.00$) and the 67.4 % of them were located in the more than 30% IOP reduction group ($p = 0.01$). The medium size blebs had bigger quantity of stroma porous mat (60%), and epithelial microcysts (56%) ($p = 0.00$).

Conclusions: The flattened configuration and the medium size of the bleb were related to the presence of histological variables that speak of good functionality of the bleb (epithelial microcysts and porous stroma mat), as well as, they also were corresponded with the bigger descent of the OIP.

Key words: Glaucoma, filtering bleb, IOP, confocal microscopy laser.

Laboratory Methods: Other

P123 ULTRASOUND-MICROBUBBLE MEDIATED C3 GENE TRANSFER LOWERED IOP IN RABBITS

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Background: To study the effects of exoenzyme C3 transferase (C3) gene expression delivered via ultrasound-microbubble mediated gene transfection in rabbits.

Methods: Plasmids (150 ng/ul) encoding C3 or copGFP (as control) were dissolved in SonoVue[®] microbubble. Eight adult New-Zealand Rabbits were anesthetized by intravenous injection of pentobarbital sodium (30 mg/kg). 80 ul of each type of microbubble-plasmid mixture was respectively injected into the anterior chambers of the eyes of one individual after equal volume of aqueous humor was drawn. The limbus corneae was exposed to ultrasound for one minute (Transmitted Frequency = 1M Hz, Sound Intensity = 1 W/cm², Duty Cycle = 20%) after injection. IOP was monitored daily for 3 weeks. Frozen sections for rabbit limbus corneae were prepared to detect GFP expression and also for immunohistochemical analysis.

Results: 1) Significant difference ($p < 0.05$) between the two groups was first shown at 48 hr after treatment. Maximum difference (2.96 ± 0.18 mmHg) was shown at 96 hr. The IOP-lowering effect lasted for at least 1 week. 2) The expression of GFP and C3 was observed at the angle of anterior chamber as well as the vicinal cornea and sclera. (3) Fiber-like

secretions were observed in the anterior chambers of some individuals 24 hr after treatment, and disappeared within 2 days. The appearance of the secretions showed no significant correlation with the IOP-lowering effect.

Conclusion: Ultrasound-microbubble mediated transfection of C3 gene was a safe and effective applicant for glaucomatous gene therapy.

Experimental Glaucoma; Animal Models: Rodent

P124 NEUROPROTECTIVE EFFECT AGAINST THE AXONAL DAMAGE-INDUCED RETINAL GANGLION CELL DEATH IN THE APOLIPOPROTEIN E DEFICIENT MICE THROUGH THE SUPPRESSION OF KAINATE TOXICITY

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Background: Apolipoprotein E (ApoE) protein played the important roles including a carrier of cholesterol, anti-oxidant, and ligand for LDL receptors. In the nervous systems, the presence of ApoE4 isoform was associated with the Alzheimer's disease. ApoE gene polymorphisms were also reported to be associated with glaucoma, however, the function of ApoE remained unclear in the retina. In this study, we investigated the roles of ApoE on the axonal damage-induced RGCs death.

Methods: Adult ApoE-deficient mice (Male, 10-12 weeks old) were used in this study. RGCs damage was induced by optic nerve crush (NC) with fine forceps for 10 seconds with or without glutamate receptor antagonists (MK801 or CNQX) 30 minutes before injury or by an intravitreal administration of Kainate (KA). Seven days later, treated retinæ were harvested and the density of surviving RGCs retrogradely labeled with fluorogold was quantified on the flat-mounted retina.

Results: ApoE protein was detected in the astrocytes and Muller cells in the retina. In the wild-type mice, NC induced the RGCs death (Control: 4085 ± 331 cells/mm², NC: 1728 ± 170) and the RGCs death was suppressed by CNQX (3031 ± 246), but not MK801 (1769 ± 212). NC- or KA-induced RGCs death was significantly less in the ApoE-deficient mice (NC: 2396 ± 193 cells/mm², KA: 4279 ± 471) than that in the wild-type mice (NC: 1728 ± 170 , KA: 2720 ± 205).

Conclusion: These data suggest that the suppression of ApoE and KA receptors had a neuroprotective effect on the axonal damage-induced RGCs death.

P125 NEUROPROTECTIVE EFFECT OF MALTOL ON OXIDATIVE STRESSED RETINAL GANGLION CELLS

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Background: Maltol (3-hydroxy-2-methyl-4-pyrone), a naturally occurring organic compound that is used primarily as a flavor enhancer, has known to have the free radical scavenging activity. It was investigated whether maltol protects the oxidative stressed retinal ganglion cells (RGCs).

Methods: For in vitro study, the primary cultured mouse RGCs were exposed to hydrogen peroxide with or without maltol. Cytotoxicity and apoptosis were determined by ATP assay and TUNEL. For in vivo study, the left middle cerebral artery (MCA) of mice was intraluminally occluded and the apoptosis of retinal cells was determined by TUNEL. Mice in the maltol group were treated once with an intraperitoneal maltol injection 30 minutes before MCA occlusion.

Results: In primary RGCs, maltol significantly attenuated the hydrogen peroxide-induced cytotoxicity from 60% to 40%, as determined by ATP assay. This observed cell damage was related to apoptotic cell death, as established by TUNEL assay. In animals, maltol treatment definitely reduced the number of TUNEL-positive retinal cells.

Conclusions: It was revealed that maltol protects the oxidative stressed RGCs in vitro and in vivo. It may offer a new neuroprotective agent for oxidative stress-related ocular diseases including glaucoma.

P126 TOLERANCE OF A POLYDIOXANONE MEMBRANE IN THE SUBCONJUNCTIVAL SPACE OF THE RABBIT EYE. POTENTIAL USE AS A DRUG DELIVERY SYSTEM AND PERSPECTIVE IN GLAUCOMA SURGERY

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Background: Polydioxanone (PDO) is a biocompatible polymer largely used in biodegradable sutures. It received FDA approval in cardiology for valvular surgery. Drugs such as mitomycin C (MMC) can be included in the core of the polymer during the synthesis process resulting in a sustained release drug delivery system as the PDO is biodegraded by hydrolysis. The duration of the hydrolysis can be modulated by adapting the synthesis parameters of the PDO. In this way, MMC or other drugs could be released progressively for up to several weeks. The aim of this preliminary study was to evaluate the clinical and histological tolerance of a PDO membrane in the subconjunctival space of the rabbit eye.

Methods: Six New Zealand White rabbits (12 eyes) were operated on under general anaesthesia: after fornix based flap and tenon dissection in all eyes, a membrane of PDO was inserted in 6 eyes whereas the subconjunctival space was left empty in the contralateral 6 eyes which served as a control. A limbal suture closed the conjunctiva in all eyes. Corticosteroid drops were applied twice daily until euthanasia. The conjunctivas were clinically evaluated daily and 2 animals were euthanized at day 7, day 15 and day 45. After Hematoxylin-Eosin staining a histological study was completed.

Results: Clinically, the PDO membrane remained visible under the conjunctiva for 2 weeks, associated with a moderate and transient hypervascularity of the conjunctiva. No difference was noted between the 2 groups at day 45. Histologically, the PDO membrane and the surrounding conjunctiva were infiltrated with a few inflammatory cells compared to control at days 7 and 15. By the 45th postoperative day, the PDO membrane had degraded and the cellularity returned to control level.

Conclusion: Polydioxanone is well tolerated in the subconjunctival space of the rabbit eye without significant inflamma-

tory response during its biodegradation. This could yield to a new drug delivery system in ophthalmology, particularly in glaucoma filtering surgery while using MMC.

P127 INTRAVITREAL TRANSPLANT OF HUMAN MESCENHIMAL STEM CELLS AS A CAPABLE SOURCE OF NEURO-PROTECTIVE GROWTH FACTORS: NEW CHALLENGING APPROACH ON THE TREATMENT OF GLAUCOMATOUS NEUROPATHY

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Background: Intravitreal injection of human mesenchymal stem cells (hMSCs) has been shown to be effective in slowing down the progression of glaucomatous degeneration in animal models. Here we studied changes in the concentration of growth factors released from human progenitor cells (hMSCs) in the vitreous cavity as well as changes in concentration of growth factors in the host retinal neurons following the intravitreal injection in a model of genetically-determined glaucoma in mice. The human mesenchymal stem cells (hMSCs), derived from human healthy placenta at term, represent a large reserve of anti-apoptotic and anti-neoangiogenic growth factors. Moreover, the placenta is a notably source of hMSCs both due to the abundance of cells which can be recovered and to the absence of ethical problems since this is a waste product. The aim of our research was to evaluate the effectiveness of transplanting hMSCs and the functional capacity of the transplant was assessed by means of the neuroprotective, anti-apoptotic and anti-angiogenic effects of the growth factors liberated from hMSCs.

Methods: Thirteen male DBA/2J strain mice were included in this randomized experimental study, conducted by the Glaucoma Study Center of the University of Bologna (Italy). All mice enrolled were treated with a single intravitreal microinjection of hMSCs at concentration of 50,000 cells/ μ L, using a micro-injector. All mice were monitored for 5 hours postoperatively and they all received a topical treatment with antibiotic eye-drops 3 times a day for a period of 7 days postoperatively.

Results: The determination of neurotrophic growth factors having an anti-apoptotic, anti-neoangiogenic and neuroprotective role, released by hMSCs, which had been implanted in the vitreous camera, was carried out using Real Time polymerase Chain Reaction (PCR). Real time PCR showed notable levels of the expression of neurotrophic factors at the vitreous level in all mice postoperatively. Qualitative and quantitative analyses of these factors showed that the greatest peaks of concentration at the endovitreous level were reached by BDNF, CNTF and NGF. The histological evaluation was performed in order to confirm the real migration of hMSCs from vitreous to retina.

Conclusions: The increased both intravitreal and retinal concentration of neuroprotective growth factors in all mice treated with hMSCs confirm its neuroprotective activity in the glaucomatous neuropathy. This innovative approach could have significant implications in the glaucoma treatment, in association with the traditional hypotonic topical therapy, although further large long-term clinical studies are required.

P128 A NEW ACUTE ATTACK GLAUCOMA ANIMAL MODEL WITH INTRACAMERAL INJECTION OF AN OPHTHALMIC VISCOSURGICAL DEVICE

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Background: Acute angle-closure glaucoma (AACG) is an ocular emergency and sight-threatening disease in which the intraocular pressure (IOP) rises suddenly due to blockage of aqueous humor outflow. It can cause permanent loss in visual acuity and visual field. In animal study, the well-established model to study AACG is by fluid infusion and by adjusting the bottle level, a high IOP can be induced in a few seconds. However, there is no blockage of aqueous outflow and the pressure rise is unrealistically fast. To mimic human AACG, we suggest to use an ophthalmic viscosurgical device, which is injected intracamerally to block the aqueous outflow. The IOP is allowed to increase naturally inside the eyeball.

Methods: Five male gerbils of age 4 months were included in this study. Healon 5 (AMO, Santa Ana, CA, USA) was injected into the anterior chamber (AC) of the right eye of the animal via a 30 g needle. When the AC was fully filled with Healon 5, the wound was dried and sealed with cyanoacrylate instant adhesive. IOP was allowed to build up and maintained at ≥ 40 mmHg for ≤ 2 h. The pressure was released manually by a corneal puncture followed by adhesive removal. Photopic ERG was performed preoperatively and at day 3, 7 and 28 postoperatively. The animal was sacrificed on day 28 and the retinas from both eyes were collected for flat mounting and sectioning. Retinal thickness and viable cell count in the ganglion cell layer were compared between the operated eye and the contralateral eye.

Results: After injection, the mean IOP change from baseline was $+60.4 \pm 6.69$ mmHg. The mean maximum IOP registered was 75.2 ± 6.22 mmHg and the mean time to achieve peak IOP was 141 ± 37.65 min. The mean duration of attack (i.e. IOP ≥ 40 mmHg) was 123 ± 6.71 min. The mean rate of increase in IOP before the attack was 0.57 ± 0.19 mmHg/min. When compared to preop, the change in mean a-wave, b-wave, photopic negative response (PhNR) and oscillatory potentials (OPs) amplitude at D28 were -42%, -42%, -25% and -29% ($p = 0.006$) respectively, in the attacked eye. There were 21.78% and 15.31% ($p = 0.041$) less neurons in the superior and inferior retina of the attacked eye than the contralateral eye. The nerve fibre layer (NFL) thickness in the attacked eye was 17.95% and 3.71% thinner than the contralateral eye at the superior and inferior optic nerve head respectively.

Conclusion: Intracameral injection of Healon 5 can successfully induce a transient acute IOP rise in gerbil. By blocking the aqueous outflow, it resembles the condition observed in human AACG. Glaucomatous changes such as reduction in visual function, neuron count and NFL thickness are observed. Our animal model proves to be a new model for human AACG.

P129 ELEVATED PRESSURE INDUCES DRP-1 MEDIATED MITOCHONDRIAL FISSION AND INCREASES REACTIVE OXYGEN SPECIES IN RETINAL GANGLION CELLS

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Purpose: To determine whether elevated pressure triggers Drp1-mediated mitochondrial fission and alters mitochondrial bioenergetics in cultured primary retinal ganglion cells (RGCs) and glaucomatous DBA/2J mice that spontaneously develop elevated intraocular pressure (IOP).

Methods: IOP in the eye of glaucomatous DBA/2J mice was measured and *in vitro* primary RGCs were exposed to elevated hydrostatic pressure. The expression and cellular distribution of Drp1 protein was assessed by immunohistochemistry, immunocytochemistry or Western blot. Mitochondrial structural changes were assessed by conventional electron microscopy (EM) and the 3D technique of electron tomography. Oxygen consumption and cytochrome c oxidase (COX) activity were measured using a Clark electrode. Cell viability was measured by MTT assay and reactive oxygen species (ROS) was measured using 2',7'-dichlorodihydrofluorescein diacetate (DCFH-DA, 10 μ M).

Results: Drp1 protein expression was significantly increased by 1.29 ± 0.04 -fold ($n = 4$ retinas per pool, $p < 0.05$) in the retinas of 9 month-old glaucomatous DBA/2J mice. Immunohistochemistry analysis showed that Drp1 immunoreactivity was increased in the ganglion cell layer of 9 month-old glaucomatous DBA/2J mice, compared with 3 month-old DBA/2J mice. Using EM analysis, 3 month-old DBA/2J mice showed the classical elongated tubular mitochondria of various lengths in RGC soma and axons of the nerve fiber layer (NFL). In contrast, 9 month-old glaucomatous DBA/2J mice showed the small rounded mitochondria with matrix swelling in RGC soma and axons of the NFL. Elevated hydrostatic pressure induced mitochondrial fission in primary cultured RGCs. Mitochondrial lengths were significantly decreased but the number of mitochondria, normalized to the total area occupied by somas in each image, was significantly increased in pressurized RGCs, compared with non-pressurized RGCs. There was no difference in mitochondrial volume density. Both respiratory capacity and oxidative phosphorylation were compromised in the retinas of 9 month-old glaucomatous DBA/2J mice, compared to the retinas of 3 month-old DBA/2J mice. Elevated hydrostatic pressure significantly increased ROS production in primary RGCs by 1.8 ± 0.2 -fold ($p < 0.05$), compared with non-pressurized RGCs.

Conclusions: These results demonstrate that elevated pressure triggered Drp1-mediated mitochondrial fission and bioenergetics alterations in RGCs during glaucomatous neurodegeneration. Based on these observations, we propose that increased Drp1 protein expression may contribute to a distinct mitochondrial dysfunction-mediated RGC death in glaucomatous retina. These results suggest that inhibition of Drp1 expression may provide new strategies to protect RGCs against glaucomatous neurodegeneration.

Experimental Glaucoma; Animal Models: Other

P130 EFFECT OF GROSS SAPONINS FROM TRIBULUS TERRESTRIS L (GSTT) ON THE CONCENTRATION OF GLUTAMIC ACID IN THE RETINAL IN RABBITS WITH CHRONIC HIGH INTRAOCULAR PRESSURE (IOP)

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Background: Glutamate is one of the components of the retina, under normal circumstances, Glutamate make retina neurons against damage, while in ischemia, anoxic condition, retinal neurons release glutamic acid increase and heavy absorbs less, high levels of glutamate cause neurons damage, therefore, restrain the excitability of glutamate toxic become glaucoma optic protect one of the main ways.

Methods: New Zealand rabbits 24 only were randomized into control (A group), high intraocular pressure group (B group), Erigeron breviscapus (Vant.) Hand-Mazz (EBHM) treatment group (C group), GSTT treatment group (D group), the 20 g/L methylcellulose into anterior chamber of the high intraocular pressure group and the two treated groups, Group C, group D daily rabbit ears margin veins push note respectively EBHM 4.5 mg/kg, GSTT 5 mg/kg. High-performance liquid chromatography (HPLC) was utilized to measure the concentration of glutamic acid in retina after 4 weeks.

Results: The concentration of glutamic acid in retina of rabbits in the high intraocular pressure group were significantly higher than those in control group and treated group ($p < 0.05$). Significant difference appeared between the treated group C and treated group D ($p < 0.05$).

Conclusion: Higher concentration of glutamate damaging retina was induced by chronic high IOP. Extract of GSTT can significantly inhibit the retina glutamate concentration.

Key words: chronic high intraocular pressure; retina; glutamic acid; High-performance liquid chromatography; GSTT.

Clinical Examination Methods: Intraocular Pressure Measurement; Devices, Continuous IOP Monitoring, Factors Affecting IOP, Twenty-Four- Hour IOP, Fluctuation

P131 FALSELY HIGH INTRAOCULAR PRESSURE IN MUCOPOLYSACCHARIDOSIS I AND VI

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Background/aims: Glaucoma is often suspected in children with mucopolysaccharidosis (MPS). The purpose of the present study is to determine the intraocular pressure, corrected with corneal hysteresis, in these children.

Methods: IOP was measured with ocular response analyzer (ORA) in seven children, five MPS I-H and two MPS VI. ORA measurements were made at a median age of 8.7 years in the patients with MPS I-H and at a median age of 9.3 years in the MPS VI patients.

Results: The ORA showed an increased corneal hysteresis and a falsely high IOP values in all 14 eyes. The re-calculated IOP were normal in all these eyes. Mild to severe corneal opacities were present in all 14 eyes. Optic disc were clinically

normal in all 12 of 14 eyes possible to examine. Severe corneal opacities hampered optic disc evaluation in the older patient with MPS VI.

Conclusion: The IOPs are often falsely high due to an increased resistance of the cornea and correlate to the extent of corneal clouding. A corrected IOP, considering the corneal hysteresis, can avoid unnecessary hypotensive treatment.

P132 THE GUARANTEE OF QUALITY STANDARDS FOR THE TONOMETRY IN OPHTHALMOLOGY

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Background: Impression tonometers are used for fast measurements of intraocular pressure on lying patients but also during surgery on the human eye. These mechanically very delicate devices have to be checked by metrological controls according to the German Medical Devices Act ('Medizinproduktegesetz') and the German Ordinance on Operators of Medical Devices ('Medizinprodukte-Betreiberverordnung') every two years. These controls are carried out by independent testing agencies and are mandatory for all ophthalmologists in Germany using impression tonometers. For this purpose, special test devices have been developed by Physikalisch-Technische Bundesanstalt, Germany's national metrology institute. A large number of these test devices is in use at private test agencies and verification offices since 1975.

Procedure and Method: Eighteen test devices for impression tonometers from private test agencies, verification offices, or Physikalisch-Technische Bundesanstalt were investigated. The instruments were checked for their measurement accuracy and their suitability to perform metrological controls. An impression tonometer of Schiötz design served as reference instrument. The test devices were investigated with respect to parameters like tonometer mass, mass of the plunger-lever-pointer system, plunger displacement, or correlation of the curvature between foot plate and plunger. The findings were analysed by statistic methods.

Results: The main outcome of the present work is the conclusion that the investigated test devices are generally suitable to perform metrological controls on impression tonometers. For certain parameters some instruments reached the error tolerances, but the majority was inside permissible limits. For one parameter (effective mass of plunger-lever-pointer system for scale value 10) the reference tonometer itself was not within permissible tolerances. This was correctly determined by all test devices. Failures of test devices due to damages or maladjustment were not observed.

Conclusion: Test devices for impression tonometers are mechanically delicate instruments. They have to be recalibrated in fixed intervals in order to remain suitable for metrological controls. If regularly maintained and recalibrated at least every three years, even devices with an age of 20 years or more are still absolutely fit for this purpose.

P133 DIURNAL VARIATION OF CORNEAL HYSTERESIS, THICKNESS, RESISTANCE FACTOR AND INTRAOCULAR PRESSURE IN NORMAL AND GLAUCOMA PATIENTS

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Purpose: To estimate of diurnal variation of the biomechanical properties of the cornea, IOP level and its relevance to glaucoma progression.

Methods: 58 patients (106 eyes) were divided into 3 groups: 1 group – 39 patients with open-angle glaucoma (68 eyes); 2 group – 10 young healthy volunteers (20 eyes); 3 group – 9 older healthy volunteers (18 eyes). All patients were undergone IOP measurement at 8.00, 12.00, 16.00, 20.00 by transpalpebral tonometer, Goldmann tonometer (GAT), i-care tonometer and evaluation of biomechanical eye properties by Ocular Response Analyzer (ORA).

Results: Minimal IOP fluctuations (corneal compensated IOP) were revealed in older healthy volunteers group, maximal – in treated glaucoma patients ($p < 0.05$). In advanced glaucoma stages IOP level got highest value in morning, than decreased in daytime and rose again towards evening. Patients with moderate and advanced glaucoma had lower data of corneal hysteresis (CH) and corneal resistance factor (CRF), and it's getting lower from stage to stage. Peak value of biomechanical eye properties was observed in morning (in advanced glaucoma patients – in daytime) and minimal value was in daytime (in moderate glaucoma patients – in evening).

Conclusion: Therefore patients with moderate and advanced glaucoma had qualitative and time shift in changes of biomechanical eye properties. They also had more significant diurnal changes in CH, CRF and IOP fluctuations and minimal CCT fluctuations in comparison with control groups ($p < 0.05$).

P134 REPRODUCIBILITY OF THE TWENTY-FOUR-HOUR DAILY CURVE OF INTRAOCULAR PRESSURE

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Background: Intraocular pressure (IOP) is the main risk factor for the development of glaucoma and the only factor that can be treated. IOP varies over a 24-hour period, but it is generally evaluated by measurements performed in the diurnal period; however, peak IOP commonly occurs outside this period. Thus, the best method for IOP evaluation is the 24-hour daily curve of intraocular pressure (DCIOP). Knowledge regarding the variability of the nycthemeral profile is important to determine individualized treatment of the patient; however, it is not known whether the DCIOP is reproducible when performed on different days.

Methods: Twenty-eight eyes of 14 patients not in treatment were studied. Of the 14 patients, 8 were diagnosed with primary open-angle glaucoma (16 eyes) and 6 had suspected glaucoma (12 eyes). Seven patients were males and seven females. Age ranged from 45 to 72 years-old, with a mean of 58.5 years-old. Three DCIOP were performed on each patient, with a minimum interval of 1 week and maximum of 3 weeks. The DCIOP consisted of 8 measurements of IOP at the following times: 9:00 a.m., 12:00 p.m., 3:00 p.m., 6:00 p.m., 9:00 p.m., 12:00 a.m. and 6:00 a.m. using a Goldmann applanation tonometer. At 6:00 a.m., IOP was measured in bed using a Perkins hand-held applanation tonometer before measuring in a seated position using the Goldmann tonometer. The IOP value was considered reproducible when the

variation between the three DCIOP measurements was ≤ 3 mmHg at each of the times and for each of the patients. Descriptive analyses of IOP variation were conducted according to the eyes, complemented with the Student t test for paired samples (right and left eyes).

Results: Considering the time of measurement, reproducibility varied from 57.1 to 100% (mean of $76.8 \pm 13.6\%$) in the right eye (RE) and from 64.3 to 92.9% (mean of $84.9 \pm 10.4\%$) in the left eye (LE). No significant difference was verified between the means of the two eyes ($p = 0.195$). In the individual examination of each patient, reproducibility ranged from 50% to 100% (mean of $80.4 \pm 19.4\%$) in the RE and from 62.5% to 100% (mean of $84.8 \pm 14.0\%$) in the LE. No significant difference was verified between the two eyes ($p = 0.266$).

Conclusion: The DCIOP presents good reproducibility when performed at up to three weeks intervals, both regarding the time of measurement and in each individual patient.

P135 THE CONFLATED CLASSIFICATION FOR METHODS OF IOP MEASUREMENT

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Background: Different methods have been described for the measurement of intraocular pressure (IOP), and due to the on-going advances in technology, the list of measuring devices is growing. This necessitates the presence of a combined classification that includes all these devices and is able to accommodate future ones.

Methods: We searched MEDLINE, EMBASE and LILACS for years 1988 to 2010. This search included published clinical studies and reviews for the different methods of measurement of IOP. In addition, we reviewed ophthalmology textbooks for the same topic. We also reviewed physics textbooks for the principles of measurement of pressure and tension. To avoid performance bias, all searches were performed by ophthalmologists who did not participate in setting the classification.

Results: Based on physical principles, 'Manometry' is direct measurement of the fluid pressure, while tonometry is the measurement of tension induced by the substance (fluid) on the surface (corneo-scleral shell). We further divided tonometry into 'Direct Tonometry'; in which measurement is directly on the surface on which the fluid is acting on to produce tension (corneo-scleral shell), and 'Indirect Tonometry'; when measurement is through an additional interface (eye lids). Tonometry devices which have been described and classified by previous reviewers now fit in the title of 'Direct Tonometry'. We reduced their lists into a classification which includes the devices that are most important historically and those used in current clinical practice. Our classification is arranged to include devices representing all principles of measurement of IOP, so that each device falls in one of the 3 main categories: manometry, indirect tonometry and direct tonometry. We named this list 'The Conflated Classification for methods of IOP measurement'.

Conclusion: This review is able to provide a simple evidence based classification that does not only consider current clinical practice, but also historical devices and futures ones.

P136 COMPARISON OF CORNEAL BIOMECHANICAL PARAMETERS OF CASES WITH BEHÇET'S DISEASE AND NORMAL SUBJECTS

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Background: To compare the corneal biomechanical parameters of cases with Behçet's disease (BD) and age and sex-matched normal subjects by ocular response analyzer (ORA).

Methods: 43 eyes of 43 cases with BD (mean age: 34.83±6.74) and 43 eyes of 43 normal subjects (mean age: 34.97 ± 6.62) were included to this prospective study. None of the cases with BD had glaucoma and taken any anti-glaucoma treatment before. Corneal hysteresis (CH), corneal resistance factor (CRF), corneal-compensated intraocular pressure (IOPcc) and Goldmann-correlated intraocular pressure (IOPg) of the cases were measured by ORA. The comparison of the results were performed by tests for statistical analysis.

Results: There were no statistically significant differences in CH ($p = 0.27$), CRF ($p = 0.06$) and IOPcc ($p = 0.08$) between the cases with BD and normal subjects. But the mean IOPg lower in cases with BD than normal subjects and the result was statistically significant ($p = 0.01$).

Conclusion: The mean IOPg of the cases with BD had statistically significantly lower than the normal subjects and it should be related with uveitis. But the differences between the other corneal biomechanical parameters with BD and normal subjects were not statistically significant.

P137 CENTRAL CORNEAL THICKNESS AND CORRECTION OF INTRAOCULAR PRESSURE IN PATIENTS WITH NORMAL TENSION GLAUCOMA, PSEUDOEXFOLIATION GLAUCOMA, OCULAR HYPERTENSION AND PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: We research significance of central corneal thickness (CCT) and correction of intraocular pressure (IOP) in patients with normal-tension glaucoma (NTG), pseudoexfoliation glaucoma (PEXG), ocular hypertension (OH) and primary open-angle glaucoma (POAG).

Method: CCT was measured in 146 eyes with glaucoma and 38 eyes without glaucoma (control group) using ultrasound pachymetre. IOP was measured by Goldman applanation tonometer (GAT). The values of IOP were corrected using correction formula by Ehlers et al. The results were statistically tested with t-test.

Results: Group 1 (NTG): 26 eyes, mean CCT is 492 ± 36.91 µm. Mean IOP is 18.27 ± 2.42 mmHg and correction of IOP is 21.18 ± 2.28 mmHg. IOP difference value is 2.91 ± 1.84 mmHg ($p < 0.0001$). Group 2 (PEXG): 18 eyes, mean CCT is 574.44 ± 31 µm. Mean IOP is 19.83 ± 4.0 mmHg and correction of IOP is 18.59 ± 3.81 mmHg. IOP difference value is 1.18 ± 1.59 mmHg ($p < 0.004$). Group 3 (OH): 14 eyes, mean CCT is 599.14 ± 24.8 µm. Mean IOP is 21.42 ± 2.5 mmHg and correction of IOP is 18.95 ± 2 mmHg. IOP difference value is -2.47 ± 1.2 mmHg ($p < 0.0001$). Group 4 (POAG): 88 eyes, mean CCT is 559.29 ± 34.4 µm. Mean IOP is 21.47 ± 4.5 mmHg and correction of IOP is 21.03 ± 5

mmHg. IOP difference value is -0.44 ± 1.68 mmHg ($p < 0.01$). Control group: 38 eyes, mean CCT is 559.18 ± 39 µm. Mean IOP is 18.65 ± 2.37 mmHg and correction of IOP is 18.14 ± 2.34 mmHg. IOP difference value is -0.61 ± 0.9 mmHg ($p < 0.001$). CCT at NTG (492.15 ± µm) compare to control group, PEXG, OH and POAG was $p < 0.001$. CCT at PEXG (574.44 µm) compare to NTG was $p < 0.001$ and to OH $p < 0.02$ but compare to control group and POAG were $p = 0.08$. CCT at OH (599 µm) compare to NTG, control group, POAG were $p < 0.001$ and to PEXG $p < 0.02$. CCT at POAG (559.29 µm) comparing to NTG and OH is $p < 0.001$ and there was no statistically difference to PEXG to control group.

Conclusions: CCT was significantly thinner in cases with NTG and significantly thicker in cases with OH. In all groups we found statistically different in actual and adjustment IOP. CCT measurement have a significant effect on the clinical management of patients with glaucoma and glaucoma suspect.

P138 CENTRAL CORNEAL THICKNESS BEFORE AND AFTER INTRAOCULAR PRESSURE REDUCTION

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Background: To investigate the possible difference between central corneal thickness during intraocular pressure rise and after intraocular pressure reduction by medications.

Methods: 30 newly diagnosed primary open-angle glaucoma patients underwent central corneal thickness measurements (ultrasonic pachymetry) while their intraocular pressures were high and those measurements were repeated after the intraocular pressure reduction was accomplished by medication. Statistical analysis was performed with commercial software (SPSS 15.0).

Results: Thirty eyes of thirty patients were included in this study. Out of 30 tested subjects 16 (53.33%) were male, the mean age of all participants was 68.40 ± 10.10 (range 45-82). Central corneal thickness measurements during intraocular pressure rise ranged from 492 to 630 µm, with mean ± standard deviation 550 ± 24.80 µm. Intraocular pressure was 28.36 ± 7.10 mmHg during the rise phase, and 19.40 ± 5.12 mmHg after the reduction which was achieved by medication. Central corneal thickness after the intraocular pressure reduction ranged from 489 to 632 µm, with mean ± standard deviation 552 ± 23.12 µm. The difference between central corneal thickness measurements during the high intraocular pressure phase and after intraocular pressure reduction was not statistically significant ($p = 0.33$).

Conclusion: In our case series, no significant change in central corneal thickness measurements was found after intraocular pressure reduction.

P139 FACTORS ASSOCIATED WITH TWENTY-FOUR-HOUR FLUCTUATION OF INTRAOCULAR PRESSURE IN NORMAL-TENSION GLAUCOMA

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Background: It is well known that intraocular pressure (IOP)

varies throughout day and night. High IOP is a major risk factor for the development and progression of glaucoma; however several studies have shown that short-term IOP fluctuation is also an independent risk factor for glaucoma (Ishida K: 1998, Asrani S: 2000, Baskaran M: 2009). Nevertheless, the factors associated with 24-hour fluctuation of IOP have not been fully investigated. Here, we investigated retrospectively the factors associated with 24-hour fluctuation of intraocular pressure in normal-tension glaucoma (NTG).

Methods: The subjects were 223 eyes of 223 patients with previously unoperated NTG (108 males and 115 females) whose mean age was 55.5 ± 12.8 years. Patients who had been previously receiving topical ocular hypotensive agents were asked to withdraw their use for ≥ 4 weeks. The patients were hospitalized for 24 hours to measure baseline IOP. IOP data were obtained in the sitting position by the same physician using a Goldmann applanation tonometer at 10 am, 1 pm, 4 pm, 7 pm, 10 pm, 1 am, 3 am, and 7 am. Standard deviation of IOP at all measurement time-points was used as an indicator of 24-hour fluctuation of IOP. Stepwise regression analysis was performed by using 24-hour fluctuation of IOP as an objective variable and age, gender, refractive error, IOP at 10 am, mean deviation as explanatory variables.

Results: Single regression analysis showed 24-hour fluctuation of IOP had the significant negative correlation with age ($\beta = -0.006$, $r^2 = -0.02$, $p = 0.03$), IOP at 10 am ($\beta = 0.077$, $r^2 = 0.12$, $p < 0.0001$) and refractive error ($\beta = -0.025$, $r^2 = 0.12$, $p = 0.03$). IOP at 10 am and refractive error were selected as explanatory variables associated with 24-hour fluctuation of IOP by stepwise multiple regression analysis.

Conclusion: Patients with higher IOP or a higher degree of myopia had bigger 24-hour fluctuation of IOP in NTG.

P140 COMPARISON STUDY OF THE IOP REDUCTION EFFICACY AND SAFETY BETWEEN LATANOPROST AND TAFLUPROST IN JAPANESE NORMAL-TENSION GLAUCOMA PATIENTS

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Background: To evaluate and compare the intraocular pressure (IOP) reduction efficacy and safety between latanoprost (Lat) and tafluprost (Taf) in Japanese normal-tension glaucoma patients, prospectively.

Methods: We enrolled 25 Japanese normal-tension glaucoma (NTG) patients who had used Lat monotherapy for more than 4 weeks, and divided into the two groups randomly; Lat to Taf group (LT group) and Taf to Lat group (TL group). At the beginning, both groups were switched from initial Lat to Lat or Taf for 12 weeks, and then switched over each drug (crossover) and used for 12 more weeks. Written informed consent was obtained from all participants. We evaluated IOP at 0, 4, 12, 16, and 24 weeks from the first switching, respectively. We also evaluated the conjunctival injection score (0-3 grade), corneal epitheliopathy score (area density classification; AD score), and the changes of eyelashes and pigmentation of eyelids or irises at 12 and 24 weeks, respectively.

Results: The mean IOP of TL group (13 eyes) were 11.1, 10.8, and 10.4 mmHg, while that of LT group (12 eyes) were 10.4, 10.8, and 11.1 mmHg at 0, 12 and 24 weeks respectively. There were no significant differences between two

groups and intra-group comparisons. The conjunctival injection score were 1.0 ± 0.4 at baseline, 1.0 ± 0.5 (Taf group) and 0.9 ± 0.5 (Lat group) at 12 weeks. The corneal AD score (total score of area and density grade) were 0.9 ± 1.2 at baseline, 0.8 ± 1.1 (Taf) and 0.6 ± 1.1 (Lat) at 12 weeks. There were no significant differences between the two drugs. The changes of eye lashes, pigmentation of eyelids and irises showed similar expressions in both groups.

Conclusion: Tafluprost and latanoprost are considered to have the equivalent efficacy and safety in the Japanese normal-tension glaucoma patients.

P141 CENTRAL CORNEAL THICKNESS AND INTRA-OCULAR PRESSURE IN CHILDREN UNDERGOING CONGENITAL CATARACT SURGERY: A PROSPECTIVE, LONGITUDINAL STUDY

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Background: Several studies, all of them retrospective, have demonstrated that central corneal thickness (CCT) is increased after surgery in children with congenital cataract. We designed a prospective study to investigate changes in CCT and intraocular pressure (IOP) in children after congenital cataract surgery, as well as risk factors associated with these changes.

Methods: 37 eyes of 26 children with congenital cataract undergoing surgery were prospectively recruited and followed for a mean of 30.5 ± 10.6 months. IOP and CCT measurements were performed before the surgery and every 6 months for 3 years. IOP measurements were performed with Goldmann or Perkins applanation tonometry and CCT was measured with an ultrasound pachimeter (Ocuscan RXP, Alcon Laboratories Inc, USA) by the same observer. Changes in IOP and CCT were analyzed with the Mann-Whitney U test, and linear regression analyses were performed to investigate the influence of age and IOP on CCT changes.

Results: Among the 37 eyes, 15 became aphakic and 22 pseudophakic. One eye (2.7%) developed glaucoma and had to undergo an Ahmed valve implantation. Mean CCT significantly increased from $556.24 \pm 44.19 \mu\text{m}$ to $585.07 \pm 56.45 \mu\text{m}$ ($p = 0.003$). Mean IOP significantly increased from $12.05 \pm 2.3 \text{ mmHg}$ to $13.89 \pm 2.96 \text{ mmHg}$ ($p = 0.037$). Age at the time of surgery was inversely correlated to CCT change ($r = -0.34$, $p = 0.04$), but not to IOP change ($r = -0.18$, $p = 0.27$). When surgery was performed between 0-1 year of age, mean CCT change was $53.25 \mu\text{m}$, compared to $14.0 \mu\text{m}$, $13.8 \mu\text{m}$, and $14.33 \mu\text{m}$ when surgeries were performed between 1-5 years, 5-10 years and > 10 years old, respectively ($p = 0.015$). IOP change was not correlated to CCT change ($r = 0.31$, $p = 0.06$).

Conclusions: CCT increases in eyes undergoing congenital cataract surgery, especially when the surgery is performed at an early age (before 1-year old).

P142 TWENTY-FOUR-HOUR IOP CONTROL WITH THE BRINZOLAMIDE/TIMOLOL OR BRIMONIDINE/TIMOLOL FIXED COMBINATIONS IN GLAUCOMA PATIENTS INSUFFICIENTLY CONTROLLED WITH TRAVOPROST MONOTHERAPY

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Background: To determine the adjunctive 24-hour intraocular pressure (IOP) efficacy of brinzolamide/timolol, or brimonidine/timolol fixed combinations (FCs) in open-angle glaucoma patients who were insufficiently controlled on travoprost monotherapy.

Methods: A prospective, observer-masked, active-controlled, crossover, comparison.

Qualified primary open-angle or exfoliative glaucoma patients with a baseline IOP > 18 mmHg at 10:00 on travoprost monotherapy were randomized for 3 months to brinzolamide/timolol, or brimonidine/timolol FCs adjunct to travoprost. Patients were then crossed over to the opposite treatment for another 3 months. At the end of the travoprost run-in and after each 3-month treatment period patients underwent 24-hour IOP monitoring.

Results: Fifty patients completed this study. The mean 24-hour baseline IOP on travoprost was 20.1 ± 1.8 mmHg. Both adjunctive FC therapies significantly reduced the IOP at each time point and for the mean 24-hour curve compared with travoprost monotherapy ($p < 0.01$). The addition of brinzolamide/timolol FC to travoprost provided significantly lower mean 24-hour IOP (17.1 ± 2.6 mmHg) versus the addition of brimonidine/timolol FC (18.0 ± 2.6 mmHg) ($p < 0.001$). Mean 24-hour fluctuation was significantly lower with travoprost monotherapy (3.7 ± 1.0) and after the addition of brinzolamide/timolol FC (3.6 ± 1.5) than the addition of brimonidine/timolol FC (4.3 ± 1.7) ($p = 0.03$ and 0.02 respectively). Both fixed combinations reduced oxygen saturation values compared with travoprost baseline ($p < 0.001$).

Conclusions: This crossover study showed that the addition of brinzolamide/timolol FC to travoprost significantly decreased 24-hour IOP with less fluctuation than the addition of brimonidine/timolol FC.

P143 REPRODUCIBILITY OF DIURNAL INTRAOCULAR PRESSURE PATTERNS EVALUATED BY TWO CONSECUTIVE DAY MEASUREMENTS

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Background: Diurnal intraocular pressure (IOP) measurement at baseline provides information about diurnal IOP curve as well as the range of IOP fluctuation and helps to set target IOP in each patient. Reassessment of diurnal IOP curve after initiation of therapy is considered to be useful to confirm the therapeutic effects. Because diurnal IOP measurements require the time and costs, IOP profiles at a single day are commonly used. However, reproducibility of diurnal IOP curves was reported to be poor. In this study, we examined the reproducibility of the diurnal IOP curve of two consecutive days in patients with normal-tension glaucoma (NTG).

Methods: Hospital records from 86 Japanese patients (50 men, 36 women; mean age, 49.4 years) with NTG were reviewed. All subjects had no history of ocular surgery and were not treated with any anti-glaucoma medications for more than 4 weeks before diurnal IOP measurements. IOPs of both eyes were measured with a Goldmann applanation

tonometer at 3-hour intervals from 6:00 to 24:00 for two consecutive days. On each day, a single experienced doctor measured IOP at all time points. IOP data from the eye with greater visual field defect were used for statistical analysis. Intraclass correlation coefficient (ICC) was used to assess the agreement of IOP at each time point and IOP changes between time points. The interpretation scheme for ICC was 'excellent' agreement beyond chance ($ICC > 0.75$), 'fair to good' ($0.4 < ICC < 0.75$) and 'poor' ($ICC < 0.4$).

Results: Seven patients showed an IOP > 21 mmHg through two consecutive measurements (i.e., primary open-angle glaucoma). For these 7 patients, the mean diurnal IOP was 18.1 ± 1.8 mmHg (range, 15.8 – 20.3). In 86 patients, the differences of mean, peak, trough IOP and IOP range (peak – trough) between two days were insignificant ($p = 0.13, 0.24, 0.40, 0.76$; paired t test). Brand-Altman plot demonstrated that mean IOP differences between two days were not statistically significant at each time point except for 6:00 (Day 1 – Day 2 = $+0.79$ mmHg [95% Confidence Interval (CI) 0.29 – 1.3 mmHg]). Intra-patient variability: ICCs [95%CI] of mean, peak, trough IOP and IOP range were 0.86 [0.79 – 0.91], 0.76 [0.66 – 0.84], 0.74 [0.63 – 0.83] and 0.31 [0.10 – 0.49]. Agreement of IOP at each time point was generally fair to good, with ICCs ranging from 0.51 to 0.68. However, agreement of IOP change between time points was uniformly poor, with ICCs ranging from 0.043 to 0.15.

Conclusions: Untreated NTG patients do not manifest reproducible IOP curve even in two consecutive days. Single-day IOP measurement is valuable in examining the mean, peak and trough IOP, but does not fully characterize IOP fluctuation of an individual patient.

P144 REPEATABILITY OF DIURNAL INTRAOCULAR PRESSURE MEASUREMENTS IN GLAUCOMA PATIENTS

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Purpose: To evaluate the short-term repeatability of diurnal intraocular pressure (IOP) pattern in subjects with primary open glaucoma on chronic ocular hypotensive therapy.

Method: Thirty cases of primary open-angle glaucoma (POAG) underwent diurnal IOP estimation (7am to 10 pm; every 3 hrs) using Goldman applanation tonometer on 2 visits, 1 week apart. One eye of each patient was analyzed to determine the agreement of individual diurnal IOP patterns from the first visit to the second visit. Intervisit agreement of IOP by time point and of IOP change between time points was assessed using intraclass correlation coefficients (ICCs).

Results: Mean age of the patients was 59.15 ± 11.12 yrs (45% females). Between-visit agreement of IOP values at each time point generally was poor to fair, with ICCs ranging from 0.04 to 0.56. The correlation between visits was lowest at 7 am (0.04) and highest at 1pm and 7 pm (0.56). Between-visit agreement of IOP change over time between time points was uniformly poor and often below that expected by chance alone, with ICCs ranging from -0.23 to 0.33.

Conclusions: POAG patients do not manifest reproducible diurnal IOP pattern when measured by Goldmann tonometry over a short time period. A single-day assessment of IOP is not adequate to evaluate adequacy of IOP control.

P145 ABSTRACT WITHDRAWN

P146 THE EFFECT OF THE CORNEAL EDEMA AFTER CATARACTS SURGERY ON PASCAL DYNAMIC CONTOUR TONOMETER, GOLDMANN APPLANATION TONOMETER AND PNEUMOTONOMETER

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Purpose: To determine the effect of corneal edema after phacoemulsification cataract surgery on measurements of intraocular pressure (IOP) using the Pascal dynamic contour tonometer (DCT), compared with the Goldmann applanation tonometer (GT) and pneumotonometer (PT).

Methods: Prospective study of a cohort of 97 patients who underwent phacoemulsification cataract surgery with intraocular lens (IOL) implantation. IOP (pneumotonometer, Goldmann and Pascal DCT), ocular pulse amplitude (OPA), and central corneal thickness (CCT) were measured in the operated eye one day before and one day, one week and one month after cataract surgery. 54 patients finished the study. Paired t-tests, Spearman correlation, and Bland-Altman plots were used to identify changes in, and relationships between these parameters.

Results: Corneal edema induced by phacoemulsification cataract surgery resulted in statistically significant increases in CCT (87.8 μ m SD 56.8; $p < 0.001$), Pascal DCT IOP (4.8 mmHg, SD 8.0; $p < 0.001$), Goldmann IOP (1.4 mmHg, SD 5.1; $p < 0.015$) and OPA (0.9 mmHg, SD 3.5; $p < 0.025$) but not in pneumotonometer IOP (1.1 mmHg, SD 5.3; $p = 0.065$). Changes in IOP measured by GT and PT were less than those measured by the Pascal DCT. The Pascal DCT provided higher IOP readings than GT and PT ($p < 0.01$) in every evaluation, with large deviations in the highest IOP readings. The variation between the Pascal DCT (Rho 0.247; $p = 0.038$), and Pneumotonometer (Rho 0.358; $p = 0.002$) was strongly correlated to the change in CCT, but not in GT measurements (Rho 0.197; $p = 0.094$).

Conclusions: Corneal edema after phacoemulsification cataract surgery increased IOP readings in the three tonometer compared, this increment is bigger in Pascal DCT readings. Changes in CCT are statistically significant associated with increased Pascal DCT IOP readings. Goldmann tonometry IOP measurements performed on edematous corneas are the most reliable, and furthermore, are less affected by corneal edema changes involved in cataract surgery

P147 CORNEAL HYSTERESIS PREDICTS INTRAOCULAR PRESSURE REDUCTION FROM MEDICAL AND SURGICAL REDUCTION OF INTRAOCULAR PRESSURE

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Purpose: To determine whether a baseline corneal hysteresis (CH) measurement was associated with intraocular pressure (IOP) reduction from medical and surgical therapy.

Design: Retrospective cohort study.

Participants: Records from 61 consecutive patients with newly diagnosed open-angle glaucoma who were initiated on pressure lowering therapy with a prostaglandin analogue

(PGA) from an untreated baseline were reviewed (PGA group), as were records from 18 eyes of 13 patients undergoing surgical IOP reduction from a variety of techniques (surgery group).

Methods: Included patients underwent CH measurement (Ocular Response Analyzer; Reichert, Buffalo, NY) and IOP assessment (IOPg) at baseline (untreated for the PGA group and on medical treatment for the surgery group) and during a subsequent follow-up visit at least 2 weeks after the initiation of therapy. Patient records were reviewed for demographic, medical and ocular data including most recent corneal thickness (CCT) measurement.

Main outcome measure: The association between the percentage of IOP reduction and the baseline CH, controlling for baseline IOP.

Results: Intraocular pressure measured by GAT was reduced by 3.2 mmHg (17.0 mmHg at baseline to 13.8 mmHg; $p < 0.001$) for the PGA group and by 18.0 mmHg (29.3 mmHg to 11.3 mmHg for the surgery group; $p < 0.001$). Corneal hysteresis increased by 0.64 mmHg (from 9.51 mmHg to 10.14 mmHg; $p = 0.003$) for the PGA group and by 3.5 mmHg (6.1 to 9.6 mmHg; $p < 0.01$) in the surgery group. Baseline CH (but not baseline CCT) was a significant predictor of the magnitude of IOP response for both groups. Because baseline IOP differed between CH quartiles for both groups, a multivariate analysis controlling for baseline IOP was performed that demonstrated that baseline CH independently predicts the percentage of IOP reduction in the PGA group ($p = 0.01$) and in the surgical group ($p = 0.04$), although baseline IOP remained a significant predictor of percentage IOP reduction ($p = 0.002$) in the PGA group.

Conclusion: Although CH is influenced by IOP, baseline CH is independently associated with the magnitude of IOP reduction from topical PGA therapy and from surgical IOP reduction.

P148 INTRAOCULAR PRESSURE ALTERATION FOLLOWING ROUTINE VISUAL FIELD EXAMINATION

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Purpose: To assess whether the Intraocular pressure (IOP) would change after visual field (VF) test in eyes with open-angle glaucoma (OAG).

Methods: This was a prospective clinical trial of 92 OAG patients without any previous surgical interventions. The IOP and subjective refraction was measured with a non-contact tonometer and with an autorefractometer before and immediately after VF test of the first eye (right), and again immediately after the second eye (left).

Results: The baseline subjective refraction was -3.81 ± 3.58 diopters (D) in the right, and -3.77 ± 3.56 D in the left eye. The mean VF testing time was 7 minutes and 28 seconds in the right and 7 minutes and 41 seconds in the left eye. The baseline IOP was 12.6 ± 2.8 mmHg in the right and 12.4 ± 2.7 mmHg in the left eye. After VF test in the first eye, the right IOP decreased significantly to 12.1 ± 2.6 mmHg ($p = 0.0001$), whereas the left IOP (12.1 ± 2.6 mmHg) had a similar tendency ($p = 0.0277$). Following VF test in the second eye, the IOP in the right and left eye was 12.1 ± 2.6 mmHg and 12.1 ± 2.7 mmHg, respectively. There was no significant difference in the right and the left IOP between following VF

examination in the right and left eye ($p = 0.9567$, $p = 0.8042$, respectively). Regarding subjective refraction, no significant difference was found.

Conclusion: In eyes with OAG, VF testing makes a slightly, but significant decrease in IOP. It might be unlikely that this phenomenon results from sustained accommodation.

P149 COMPARISON OF THE EFFECT OF CENTRAL CORNEAL THICKNESS DETERMINED BY ULTRASOUND PACHYMETRY AND BY PENTACAM ON GOLDMANN APPLANATION TONOMETRY AND ON DYNAMIC CONTOUR TONOMETRY

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Background: to compare the effects on dynamic contour tonometry (DCT) and Goldmann applanation tonometry (GAT) of central corneal thickness (CCT) determined by ultrasound pachymetry (UP) and Pentacam (PC).

Methods: 65 consecutive patients with primary open-angle glaucoma (POAG) were examined. The agreement between the pachymetric instruments was assessed by calculating intraclass correlation coefficients (ICC) and Passing-Bablok regression line. Four linear regression models were constructed, (each tonometry system as dependent variable and each pachymetric system as predictive variable).

Results: Intraclass correlation coefficient between UP and PC were 0.778 (CI 95%: 0.661-0.859). Passing-Bablok regression line ($x = UP$; $y = PC$) revealed a systematic ($A = 122 \mu m$; CI 95%: 258- -37) and a proportional bias ($B = 1.22$; CI 95%: 1.07-1.48). The regression analysis revealed that DCT was not influenced by UP and PC while GAT is affected by UP (adjusted $r^2 = 0.3$; $B = 0.043$; CI 95% for B : 0.024-0.063) and PC (adjusted $r^2 = 0.25$; $B = 0.036$; CI 95% for B : 0.021-0.052).

Conclusions: although CCT measurements obtained using PC and UP are not completely interchangeable, the method used to determine this parameter has not relevant repercussion on GAT and TCD.

P150 REPRODUCIBILITY OF CORNEAL BIOMECHANICAL FACTORS MEASURED BY OCULAR RESPONSE ANALYZER

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Background: To evaluate the inter- and intra-observer variability of Ocular Response Analyzer (ORA, Reichert Ophthalmic Instruments, Depew, NY) measurements, namely corneal-compensated intraocular pressure (IOPcc), Goldmann-correlated intraocular pressure (IOPg), corneal hysteresis (CH) and corneal resistance factor (CRF) and to

evaluate the relationships among the IOPs obtained by ORA, Goldmann applanation tonometer (GAT) and non-contact tonometer (NCT).

Methods: This is an observational clinical study including 41 normal eyes from 26 healthy volunteers. 3 clinical observers performed 4 repeated ORA measurements with 1 to 2 minute-intervals. 3 consecutive NCT and GAT measurements were performed by 1 masked observer respectively. Central corneal thickness (CCT) was measured by ultrasonic pachymetry (Tomey, Japan). The inter- and intra-observer reproducibility for IOPcc, IOPg, CH and CRF was assessed by ANOVA-based intraclass correlation coefficient (ICC) and coefficient of variation (CV). Correlation between IOP measurements and other continuous parameters was calculated using Pearson's correlation coefficient.

Results: The mean ICC for inter-observer reproducibility was 0.89 for IOPcc, 0.93 for IOPg, 0.87 for CH, and 0.91 for CRF. The corresponding CV values were 17.09%, 19.29%, 12.82% and 15.41% respectively. The intra-observer ICC values for IOPcc were 0.77 for the first observer, 0.85 for the second. CV was 16.83% and 14.91% respectively. For IOPg, the intra-observer ICC values were 0.85 and 0.89. The corresponding CV values were 15.21% and 16.38%. For CH, the intra-observer ICC values were 0.74 and 0.84 and corresponding CV values were 12.48% and 13.19%. The intra-observer ICC for CRF was 0.80 for the first observer, 0.86 for the second. The respective CV values were 11.77% and 15.20%. The mean IOP values for GAT, NCT, IOPcc and IOPg were 13.55 ± 2.23 mmHg, 13.38 ± 2.28 mmHg, 13.64 ± 2.33 mmHg and 13.04 ± 2.51 mmHg. The differences in mean IOP values between GAT and IOPcc, between GAT and IOPg, between NCT and IOPcc, and between NCT and IOPg were not statistically significant ($p > 0.05$). But the difference in mean IOP values between IOPcc and IOPg was statistically significant ($p = 0.02$). The correlations of CCT with GAT, NCT and IOPg were significant ($p < 0.05$), but there was no significant correlation between CCT and IOPcc ($p > 0.05$).

Conclusion: The ORA provides reproducible data on biomechanical factors of normal cornea notably IOPcc, IOPg and CH. The intra-observer reproducibility was substantial for IOPcc, IOPg, CH and CRF, for all observers. Also, the average IOP measured with ORA did not result in significant differences from GAT and NCT. In conclusion, ORA provides valid, reproducible measures of IOP and biomechanical factors of cornea.

P151 RELATIONSHIP BETWEEN CORNEAL BIOMECHANICAL PROPERTIES, CENTRAL CORNEAL THICKNESS AND INTRAOCULAR PRESSURE IN NORMAL, GLAUCOMA SUSPECTS AND GLAUCOMATOUS EYES

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Background: Goldmann applanation tonometry (GAT) is regarded as the reference standard by which to measure intraocular pressure (IOP). Although GAT may be less prone to biomechanical influence than Schiøtz tonometry, it is affected by corneal biomechanical influences such as hydration, elasticity, hysteresis and rigidity. Achieving accurate estimates of IOP remains difficult. Until recently, corneal bio-

mechanical properties could not be measured in vivo. The Ocular Response Analyzer (ORA; Reichert Ophthalmic Instruments, Inc., Buffalo, NY, USA) is a new, non-invasive device that analyses corneal biomechanical properties simply and rapidly. The ORA allows cornea compensated IOP measurements and can estimate corneal hysteresis (CH) and rigidity. It is designed to improve the accuracy of IOP measurement by using corneal biomechanical data to calculate a biomechanically adjusted estimate of intraocular pressure. The ORA generates two separate IOP output parameters: Goldmann-correlated IOP (IOPg), and the Corneal-compensated IOP (IOPcc). In this study we evaluated corneal hysteresis (CH), corneal rigidity factor (CRF), corneal compensated IOP (IOPcc) and Goldman correlated IOP (IOPg) and correlated these values with routinely measured GAT IOP readings and central corneal thickness (CCT) measurements in normal, glaucoma suspects [including ocular hypertensives (OHT) and primary angle closure (PAC)] and glaucomatous eyes.

Methods: This cross-sectional study included 216 eyes of 216 participants who had received no ophthalmic treatment in the forms of drops, laser or surgery. 93 normal, 62 glaucoma suspects with suspicious discs, 40 primary angle closure (PAC), 11 OHT and 10 primary open-angle glaucoma (POAG) eyes were studied. All recruited subjects underwent measurement of corneal hysteresis (CH), corneal rigidity factor (CRF), corneal compensated IOP (IOPcc) and Goldmann correlated IOP (IOPg) by the ORA, CCT measurement by ultrasonic pachymetry and IOP measurement by GAT. Pearson's correlation coefficient was used to correlate ORA measurements, IOP measured by GAT, and CCT in all groups. Bland-Altman's plots used to assess agreement between IOP measured by GAT and the ORA. Receiver Operating Characteristics (ROC) curves and areas under these curves (AROCs) calculated for CH, CRF, IOPcc and GAT-IOP to assess the ability of each measured parameter to differentiate healthy from glaucoma suspect, OHT and glaucomatous eyes.

Results: IOPg and IOPcc measurements were significantly higher ($p < 0.001$) than GAT-IOP in all groups of patients. The corneal resistance factor (CRF) measurements were significantly higher in the OHT group compared to normal ($p = 0.002$), disc suspect ($p = 0.001$) and PAC ($p = 0.046$) groups. CCT correlated significantly with all parameters except the IOPcc. The mean difference between IOPg and GAT-IOP was 1.1 mmHg, but the 95% limits of agreement between the two instruments were poor (between -6.5 and 8.7 mmHg; Figure 1). CRF had the highest AROC (0.879; $p < 0.001$) followed by the CCT (0.781; $p = 0.002$) between OHT and normals.

Conclusions: Corneal biomechanical data appear to be a promising addendum to the complex issues of glaucoma occurrence and prognosis. Corneal factors such as CCT, corneal hysteresis and CRF may constitute a pressure-independent risk factor for glaucoma. However, IOP measurements from the ORA are not interchangeable with, and are unlikely to replace Goldmann Applanation Tonometry in the present time.

P152 DOES PHACOEMULSIFICATION REALLY LOWER IOP? OR CAN IT BE EXPLAINED BY CORNEAL BIOMECHANICAL CHANGES? A THREE-MONTH ASSESSMENT USING GOLDMANN, ORA AND PASCAL TONOMETRY IN PATIENTS WITHOUT GLAUCOMA

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Background: Cataract removal by phacoemulsification has been long described as a procedure that lowers intraocular pressure (IOP) in patients with and without glaucoma. Since this has been studied using Goldmann Applanation Tonometry (GAT) and cataract surgery is related to changes in central corneal thickness (CCT), a possible explanation of the observed IOP lowering could be changes in CCT and other corneal biomechanical properties. The objective was to establish the difference between IOP measurements with the dynamic contour tonometer (DCT-Pascal tonometer) and ocular response analyzer (ORA) as compared with GAT, and describe changes in CCT, corneal hysteresis (CH) and corneal resistance factor (CRF) after uneventful phacoemulsification in patients without glaucoma.

Methods: We included 46 eyes of 46 patients with visually significant cataract but visual acuity of at least 20/800, without history of glaucoma or ocular hypertension, axial length between 21 and 25 mm and less than 2D of keratometric cylinder (to avoid disturbing GAT measurements) that signed an informed consent to participate in the study. Six patients were excluded from the analysis due to complications. We measured CCT, CH, CRF and IOP, using GAT, DCT and ORA (both cornea-corrected (ORA-PCC) and Goldmann-equivalent IOP (ORA-GCC) before surgery and at postoperative days (POD) 7, 30 and 90. The study was approved by our institution's ethics committee before enrollment began.

Results: Mean basal CCT was 529 μ m, increased to 556 at POD 7 ($p < 0.001$), improved to 536 at POD 30 ($p = 0.114$) and became 524 at POD 90 ($p = 0.211$, figure 1). Mean basal CH and CRF were 8.1 and 9.1 respectively, and both were initially lowered to 7.2 and 8.2 at POD 7 ($p < 0.001$), 7.6 and 8.7 at POD 30 ($p = 0.008$ and $p = 0.016$), returning to near basal values of 8.8 and 9.3 ($p = 0.133$ and $p = 0.338$, figure 2). Mean basal GAT IOP was 14.1 mmHg, and was initially unchanged at 13.4 on POD 7 ($p = 0.147$), 13.8 on POD 30 ($p = 0.634$) and lowered to 11.2 on POD 90 ($p < 0.001$, figure 3). Mean basal ORA-PCC was 20.4 mmHg and mean basal ORA-PCG was 17.7 mmHg, both were also initially unchanged at 20.7 and 17.2 on POD 7 ($p = 0.674$ and $p = 0.408$), 21.0 and 18.0 on POD 30 ($p = 0.207$ and $p = 0.668$), and also lowering to 18.6 and 16.1 on POD 90 ($p = 0.022$ and $p = 0.016$, figure 4). Finally, more closely resembling GAT changes, mean basal DCT was 18.3 mmHg, was also unchanged initially at 17.6 on POD 7 ($p = 0.135$), 18.5 on POD 30 ($p = 0.259$) and lowered to 15.6 on POD 90 ($p < 0.001$, figure 5).

Conclusions: Uncomplicated phacoemulsification in normal patients induces transient corneal biomechanical changes that return to basal after 3 months, and IOP is effectively lowered a mean 3 mmHg as measured with GAT and DCT, and 2 mmHg as measured with ORA.

P153 FACTORS EFFECTING OCULAR PULSE AMPLITUDE

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Purpose: To define the correlation between ocular pulse amplitude and intraocular pressure (IOP), central corneal thickness (CCT) and measurement quality score (QS) in eyes that dynamic contour tonometry (DCT) was used to obtain IOP rates.

Method: Eyes diagnosed as primary glaucoma or glaucoma suspect were evaluated via Goldmann applanation tonometer (GAT), non-contact puff tonometer (NCT), DCT and pentacam after complete ophthalmological examination. Cases that showed any corneal abnormality on topography or biomicroscopy were excluded. DCT measurements taken from one eye per patient that have QS of 1-3 have been included.

Results: Sixty-three eyes of 63 cases with a mean age of 56 years were enrolled into the study. Mean IOP readings using DCT, GAT, NCT were obtained as 20.2 ± 4.4 , 17.5 ± 4.4 , and 18.0 ± 5.1 mmHg respectively. Mean QS was 2.1 ± 0.8 and mean CCT was 558.7 ± 40.0 μ m. IOP readings acquired with DCT were significantly higher than values taken with GAT and NCT. There was no significant difference between the mean IOP values attained via GAT and NCT. A negative weak correlation was observed between OPA and QS in regression model ($p < 0.05$ $r^2 = 0.09$). The correlation between DCT and OPA was below the statistical significance.

Conclusion: IOP readings obtained via DCT are higher than both GAT and NCT. OPA values may be influenced by DCT measurement quality.

P154 REPRODUCIBILITY OF MODIFIED DIURNAL TENSION CURVE AND WATER DRINKING TEST

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Purpose: to verify the reproducibility of IOP parameters from the water drinking test (WDT) and modified daily tension curve (mDTC) in patients with ocular hypertension (OH) or open-angle glaucoma (OAG).

Methods: prospective analysis of 88 eyes from 88 OH or OAG patients submitted to mDTC (IOP measured at 8:00, 11:00, 14:00 and 16:00 hours) followed by the WDT performed by the same examiners in two consecutive days. For statistical analysis, the intraclass correlation coefficient test (ICC) was used. Poor, fair and excellent reproducibility were considered when ICC values were below 0.4, from 0.4 to below 0.75 and above 0.75, respectively.

Results: mDTC analysis: IOP at 8:00, 11:00, 14:00 and 16:00 hours presented ICC levels of 0.80, 0.82, 0.83 and 0.76, respectively. Mean mDTC IOP, maximum IOP, minimum IOP and fluctuation during mDTC presented ICC values of 0.91, 0.85, 0.83 and 0.60, respectively. WDT analysis: IOP peak and IOP fluctuation during WDT presented ICC values of 0.79 and 0.37, respectively. Diurnal fluctuation, calculated as the difference between the IOP peak detected by the WDT and the minimum IOP detected by the mDTC presented an ICC value of 0.84 (all ICC values, $p < 0.001$). **Conclusion:** IOP peaks detected by the WDT and mDTC as well as mean

mDTC IOP presented excellent reproducibility parameters. mDTC fluctuation and WDT fluctuation were the least reproducible parameters. However, diurnal fluctuation (difference between WDT IOP peak and minimum mDTC IOP) presented an excellent reproducibility level.

P155 TRABECULECTOMY AUGMENTED WITH MITOMYCIN C IS PROTECTIVE AGAINST INTRAOCULAR-PRESSURE RISE IN THE SUPINE POSITION

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Background: The intraocular pressure (IOP) increases substantially in the supine position. A new system (patent pending) was developed that enables accurate measurement of the IOP in the side-lying position using the standard Goldmann applanation tonometer.

Purpose: To measure and compare the amount of IOP elevation in the supine position between operated and medically treated glaucoma eyes.

Patients: Ten patients with chronic simple glaucoma or exfoliation glaucoma in whom only one eye was operated and their fellow-eye was treated with various topical preparations.

Methods: The IOP was first measured in the sitting position. It was then measured in side-lying position after 15 minutes of lying supine.

Results: In the medically treated glaucoma eyes the IOP increased 5.7 ± 1.3 mmHg (range 4 to 8 mmHg) while in their fellow post-trabeculectomy eyes the increase in IOP while supine was only 1.8 ± 1.6 mmHg (range 0 to 5 mmHg) ($p = 0.000$, paired t-test). There was no significant correlation between the IOP elevation in the supine position in the glaucomatous eyes and their fellow trabeculectomy eyes.

Conclusion: Trabeculectomy but not topical anti-glaucoma medication may prevent IOP increase in the supine position.

P156 NURSE-LED INTRAOCULAR PRESSURE MEASUREMENTS IN MOORFIELDS AT ST GEORGE'S HOSPITAL: AN AUDIT

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Objective: The aim of this audit was to assess and improve the accuracy of intraocular pressure (IOP) measurements performed by the nurses both at the glaucoma clinics and on the wards at the Moorfields St George's Hospital. Spot checks had revealed discrepancies in these measurements and the purpose of this study was to identify and address potential areas of concern.

Methods: The methods we used included a questionnaire completed by the nurses, in order to highlight areas of weakness, in which further training was required, as well as IOP spot checks and 1-1 observation and feedback from the supervising ophthalmologist. The ST1 standards served as the gold standard (max score 9) [1].

Results: In the first cycle 22 nurses were assessed. Their mean score was 7.5 and in 37.5% of the cases IOPs were more than 2 mmHg away from the assessor. The mean difference from the assessor was 3.8 mmHg. Errors in technique included using too thick a mire (56%), non-central apposition (50%), being unclear of measurement end point

(31%), pressing too hard on the cornea (12%) and using too thin a mire (6%). Following constructive feedback the audit cycle was repeated including again 22 nurses. Interestingly, the mean score achieved this time was 8.5, with only 12% of IOPs being more than 2 mmHg away from the assessor and the mean difference from the assessor being reduced to 3 mmHg.

Conclusions: Our questionnaire and our 1-1 training and direct feedback led to significant improvement in the accuracy of the nurses' IOP measurements.

Reference: [1] Workplace based assessment handbook for OST year 1, The Royal College of Ophthalmologists.

P157 HOW ACCURATE ARE DISPOSABLE PRISMS AN ADEQUATE ALTERNATIVE TO STANDARD GOLDMANN TONOMETRY PRISMS IN GLAUCOMA PATIENTS?

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Purpose: To evaluate the accuracy and reliability of 2 single-use tonometry devices (Tonosafe and Tonojet) as an alternative to standard Goldmann prisms in patients attending dedicated glaucoma clinics.

Design: Prospective experimental study with human subjects.

Participants: One hundred glaucoma patients who attended 2 glaucoma clinics at the Worcester Royal Hospital between September and December 2010.

Methods: During each examination, intraocular pressure (IOP) was measured 3 times, using the standard Goldmann prism, Tonosafe, and Tonojet, respectively. The prism sequence was predetermined with random table, and the measurements were taken at 5-minute intervals.

Main outcome measure: Intraocular pressure.

Results: Intraocular pressure ranged from 04 to 52 mmHg. Analysis indicated that there was a good agreement between Goldmann and Tonosafe (average difference = 0.53). On the other hand, Tonojet under-recorded the eye pressure (average = 1.43) in significant number of cases ($p = 0.013$).

Conclusions: Caution should be exercised when using Tonojet prisms as they tend to record eye pressure lower than standard Goldmann prism.

P158 COMPARISON OF SUPINE AND SITTING INTRA-OCULAR PRESSURE IN PATIENTS UNDERGOING DIURNAL CURVES

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Purpose: To compare supine and sitting intraocular pressure in patients undergoing diurnal curves.

Methods: 100 consecutive patients undergoing diurnal intraocular pressure (IOP) monitoring were included in the study. Patients were diagnosed with normal-tension glaucoma (NTG) or primary open-angle glaucoma (POAG) showing progression or were NTG suspects. IOP was measured with Goldmann tonometry (GAT) at 8.30, 10.30, 12.30, 14.30 and 16.30. At 12.30, IOP was measured by Tonopen with the patient supine after staying supine for 30 minutes; IOP was then measured in sitting position with Tonopen and GAT.

Results: Mean supine IOP at 12.30 was significantly higher ($p < 0.001$) than mean IOP by Tonopen or by GAT in sitting

position. There was no significant difference between mean Tonopen and GAT IOP in the sitting position ($p > 0.05$). Supine IOP was increased in 77% of right eyes (RE) and 82% of left eyes (LE) compared to the sitting IOP and was more than 20% higher than sitting IOP in 29% of RE and 23% of LE. The highest IOP values ($p < 0.001$) during the whole monitoring period (60% of RE and 56% of LE) were obtained in the supine position. Change in diagnosis from NTG or NTG suspects to POAG or POAG suspects was made in 9% of patients based on the sitting IOP diurnal curve; however, when supine IOP values were included, a change in diagnosis occurred in an additional 12% of patients.

Conclusion: Supine IOP is significantly higher than sitting IOP in POAG, NTG and NTG suspects undergoing diurnal IOP monitoring. The diagnosis and management of an additional 12% of our patients changed based on supine IOP elevation.

P159 CONTINUOUS IOP MONITORING IN GLAUCOMA PATIENTS TREATED WITH TAFLUPROST

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Background: Intraocular pressure (IOP) is recognized as a major risk factor for the development of glaucoma and is at present the only modifiable risk factor. IOP varies throughout the diurnal and nocturnal periods and according to body posture. Studies have shown that an IOP variation of 1 mm Hg produces a change of central corneal curvature radius of approximately 3 μ m. The SENSIMED Triggerfish[®] sensor (sensor) is a disposable silicone contact lens with an embedded micro-electromechanical system, which measures changes in corneal curvature induced by variations in IOP. An antenna, mounted around the eye, receives the data, which are then transmitted to a recorder. This technology has the potential to provide hitherto unobtainable data on the chronobiology of IOP, possibly leading to improved care of glaucoma patients. The aim of this study was to investigate the ability of the sensor to continuously monitor IOP fluctuations throughout 24-hours.

Methods: Fifteen patients with open-angle glaucoma underwent 24-hour monitoring with the Sensor. All patients were treated with once-daily tafluprost drops (Santen Inc). Goldmann applanation tonometry (GAT) was done before and after Sensor monitoring.

Results: GAT was 12 and 13 mm of Hg before and after monitoring, respectively. A 24-hour SENSIMED Triggerfish[®] sensor output signal was recorded for all patients. The Sensor was well tolerated by patients as no complaints and serious adverse effects were recorded.

Conclusion: The Triggerfish[®] sensor allowed monitoring IOP throughout 24-hours in glaucoma patients providing clinically useful data.

P160 ASSESSING THE RELATIONSHIP BETWEEN CORNEAL BIOMECHANICAL PROPERTIES AND CORNEAL CURVATURE, AXIAL LENGTH, CENTRAL CORNEAL THICKNESS AND REFRACTIVE ERRORS IN THE HEALTHY SUBJECTS

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Purpose: To compare the relationship between corneal biomechanical properties and corneal curvature (CC), axial length (AL), central corneal thickness (CCT) and refractive errors (RE) in the healthy subjects.

Methods: 79 eyes from 40 healthy subjects elderly than 40 years were enrolled in this prospective study. The subjects with corneal pathologies, refractive errors higher than 3 D, history of ocular surgery, uveitis, diabetes mellitus and glaucoma were excluded. Best-corrected visual acuity, refractive error, CC, CCT and AL of the subjects were evaluated. Corneal hysteresis (KH), Corneal Resistance Factor (CRF), ccIOP, gIOP measurements were measured by Ocular Response Analyzer (ORA). CCT was determined by ultrasound pachymetry.

Results: Between $-3.0 \text{ D} \pm 2.5 \text{ D}$ and $-2.5 \text{ D} \pm 1.5 \text{ D}$ were the spherical and cylindric errors respectively. The values of mean keratometry $7.71 \pm 0.4 \text{ mm}$, mean CCT $539 \pm 32.1 \mu\text{m}$ and mean AL $23.14 \pm 1.6 \text{ mm}$ were recorded. CH and CRF the data provided by the ORA were $9.7 \pm 1.6 \text{ mmHg}$ and $9.9 \pm 2.2 \text{ mmHg}$ respectively. CCT showed significant correlation with CH and CRF. There was no correlation between keratometry and CH and CRF. Significant negative correlation was defined between AL and CH measurements. Significant negative correlation was seen between CRF and spherical values.

Conclusion: There was a correlation between CCT, CH and CRF. Negative correlation was defined between AL and CH measurements. Negative correlation was also found between CRF and spherical values.

P161 ABSTRACT WITHDRAWN

P162 COMPARISONS BETWEEN APPLANATION TONOMETER, NON-CONTACT TONOMETER AND REBOUND TONOMETER IN HEALTHY SUBJECTS AND PATIENTS WITH GLAUCOMA OR OCULAR HYPERTENSION

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Purpose: To determine Goldmann applanation tonometer (GAT), non-contact tonometer (NCT) and iCare® rebound tonometer (RT) agreement in the measurement of intraocular pressure (IOP) of healthy subjects and the patients with glaucoma or ocular hypertension (OHT).

Methods: Seventy eyes of 35 healthy subjects (group 1) and 70 eyes of 35 patients with glaucoma or OHT (group 2) were enrolled and IOP measured between 1 and 4 pm. Non-contact tonometer was performed first, and then rebound tonometer was performed second, followed by 3 consecutive GAT measurements. Agreement between three tonometers was evaluated using the Bland-Altman method and the mean IOP values were compared by one-way ANOVA test.

Results: In group 1, mean IOP (\pm SD) taken with RT, GAT, and NCT was 13.7 ± 4.0 , 16.3 ± 3.7 , and $15.8 \pm 3.0 \text{ mmHg}$, respectively. Mean difference between IOP values was GAT-RT $2.6 \pm 2.7 \text{ mmHg}$ ($p < 0.001$) and GAT-NCT $0.6 \pm 2.1 \text{ mmHg}$ ($p = 0.154$). The Bland-Altman plot revealed that RT underestimated IOP compared to GAT in healthy subjects (95% limits of agreement: $-2.7/7.9 \text{ mmHg}$). In group 2, mean IOP (\pm SD) measured by RT, GAT, and NCT was $15.2 \pm 5.7 \text{ mmHg}$, $17.7 \pm 5.4 \text{ mmHg}$, and $15.8 \pm 5.2 \text{ mmHg}$, respectively. Mean difference of IOP values was GAT-RT $2.6 \pm 2.4 \text{ mmHg}$ ($p < 0.001$) and GAT-NCT $2.0 \pm 2.5 \text{ mmHg}$ ($p < 0.001$); under-

estimation of IOP by both RT and NCT compared to GAT was noted on Bland-Altman plot (95% limits of agreement: $-2.1/7.2 \text{ mmHg}$ for RBT, $-3.0/6.9$ for NCT).

Conclusions: RT and NCT underestimated IOP similarly in group 2 as compared with GAT. The iCare® rebound tonometer is not a substitute for the GAT measurement, when an accurate IOP is needed.

P163 AGREEMENT BETWEEN REBOUND TONOMETER, OCULAR RESPONSE ANALYZER, DYNAMIC CONTOUR TONOMETER, AND GOLDMANN TONOMETER IN MEASURING INTRAOCULAR PRESSURE

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Background: To evaluate the agreement between rebound tonometer (RBT), ocular response analyzer (ORA), dynamic contour tonometer (DCT), and Goldmann applanation tonometer (GAT) in measuring intraocular pressure (IOP), and the influence of the corneal properties on the difference in IOP measurements between these tonometers.

Methods: A total of 57 eyes of 18 healthy individuals and 39 glaucoma patients were included. Central corneal thickness (CCT) was obtained using ultrasonic pachymetry (mean of 3 measurements) and keratometry (central corneal curvature) readings were based on the automated keratometry. Corneal hysteresis (CH) was obtained using the ORA. IOP measurements were taken using iCare RBT (mean of 6 readings), corneal-compensated ORA IOP (mean of 4 readings), Pascal DCT (mean of 2 readings) and GAT (mean of 2 readings) in random order with an interval of 10 minutes among the devices.

Results: The mean (SD) IOP obtained with RBT, ORA, DCT and GAT was $15.2 (6.5) \text{ mmHg}$, $18.7 (6.8) \text{ mmHg}$, $16.5 (3.9) \text{ mmHg}$ and $15.3 (5.7) \text{ mmHg}$ respectively. The mean (SD) CCT was $538.2 (37.9) \mu\text{m}$. The mean (SD) keratometry was $44.35 (1.64)$ diopters. The mean (SD) CH was $9.00 (1.72) \text{ mmHg}$. The agreement between tonometers is shown in Table 1 (image 1). The correlation between differences in IOP measurements and corneal properties is shown in Table 2 (image 2).

Conclusions: Poor agreement was found between tonometers. The CCT was correlated with the difference between RBT and DCT measurements, and between DCT and GAT measurements. The CH is correlated with the difference between RBT and GAT measurements.

P164 INTRAOCULAR PRESSURE CHANGES DURING AN ACROBATIC ROUTINE

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Background: There are many articles describing posture-induced intraocular pressure changes. Pole fitness is a form of physical training that is gaining great acceptance. It combines elasticity, flexibility and strength. Pole fitness routines include inverted positions. The purpose of this study is to determine the intraocular pressure (IOP) changes during an acrobatic routine of pole fitness.

Methods: This is a prospective case observational series.

Eleven subjects (9 women and 2 men) from a pole fitness studio volunteered for the study. All participants underwent an ophthalmic examination. Intraocular pressure was recorded using a Tonopen after 10 min of rest (baseline), 1 min of decubitus prone position, 1 min of sitting position in the pole and 1 min of outside hook position in the pole. Cardiac frequency and blood pressure were also recorded. Statistical analysis was performed with the Kruskal-Wallis and Wilcoxon tests.

Results: Compared with baseline IOP, all other positions showed significant increase in IOP ($p < 0.05$). There were statistical differences between outside hook position IOP and baseline, and decubitus prone and sitting positions IOP ($p < 0.05$). There was no statistical difference between prone position and sitting position IOP ($p = 0.168$). Median IOP increase was 8 mmHg for outside hook position, 2 mmHg for prone position and 1 mmHg for sitting position. For cardiac frequency, there were no statistical differences between baseline and prone positions ($p = 0.121$), outside hook and baseline positions (0.068), and outside hook and sitting positions ($p = 0.114$). For mean blood pressure, there were no statistical differences between baseline and prone positions ($p = 0.064$), nor between outside hook and sitting positions ($p = 0.091$).

Conclusion: There is a significant change in the IOP during a pole fitness routine, particularly during outside hook position.

P165 SENSIBILITY AND SPECIFICITY OF ICARE® REBOUND TONOMETER COMPARED TO GOLDMANN APPLANATION TONOMETER

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Background: Goldmann applanation tonometry (GAT) has been considered the gold standard in the measurement of intraocular pressure (IOP) in the past time. The aim of the study was to evaluate the accuracy of measurement of IOP using a new induction/impact rebound tonometer (ICare®) compared with GAT. The systematic and random errors (bias) of the two methods had been quantified, to evaluate the sensitivity and specificity of the ICare® tonometer in identifying patients with 21 mmHg or more obtained with GAT, and to consider the influence of corneal thickness on IOP measurement with the two devices.

Methods: The IOP values obtained with the two instruments in 97 patients were compared and processed with Bland and Altman methods.

Results: The analysis revealed that the IOP values recorded with the ICare® tonometer were slightly higher than those obtained with the GAT. The estimated bias for right-eye measurements was 0.78 mmHg with 95% limits of agreement ± 3.55 mmHg. This overestimation, which is not clinically relevant, was confirmed when we used the IOP values corrected according to central corneal thickness for data analysis. The sensitivity and specificity were 0.90 and 0.95, respectively.

Conclusions: The accuracy of ICare® tonometer seems to be comparable with GAT and can be used also by non ophthalmologist and paramedicals. Therefore ICare® tonometer could be considered a valid alternative to the GAT in large population screening or when the condition of the patient do not allow the use of GAT.

P166 DIURNAL VARIATION IN GOLDMANN APPLANATION TONOMETRY DOES NOT CORRELATE WITH DIURNAL VARIATION IN CORNEAL HYSTERESIS IN NON-GLAUCOMATOUS INDIVIDUALS

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Purpose: To determine whether the diurnal variability of Goldmann applanation tonometry (GAT) and corneal hysteresis (CH) are correlated in non-glaucomatous individuals.

Methods: Thirty-five non-glaucomatous individuals were recruited within an academic ophthalmology practice. Participants underwent GAT and CH assessment every two hours from 8 AM until 8 PM on a single day.

Results: Both GAT and CH exhibited diurnal variation. The mean range for GAT was 4.5 (OD) and 4.1 (OS). The mean range for CH was 1.9 (OD) and 2.7 (OS). These values were significantly greater than zero ($p < 0.05$). To assess whether GAT and CH exhibit diurnal co-variability, the change in GAT and change in CH between consecutive time points were calculated for each participant. GAT and CH change scores for each time interval were then correlated, with separate correlations performed for each time interval and eye. None of these 12 correlations reached statistical significance when Type I error was controlled at 0.05.

Conclusions: Both GAT and CH exhibit diurnal variability in non-glaucomatous individuals; however, the present study produced no evidence of co-variability between them.

Clinical Examination Methods: Tonography, Aqueous Flow Measurement

P167 CORRELATION BETWEEN INTRAOCULAR PRESSURE AND OCULAR PULSE AMPLITUDE MEASURED WITH PASCAL DYNAMIC CONTOUR TONOMETER AND CHOSEN BIOMETRIC PARAMETERS OF THE GLOBE IN GLAUCOMA PATIENTS AND HEALTHY SUBJECTS

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Background: Pascal Contour Dynamic Tonometer (DCT) is a diagnostic tool developed for precise, digital intraocular pressure measurements, irrespectively of individual corneal parameters: central corneal thickness and corneal curvature. The DCT operating principle is based on evaluating the corneal surface tension by the chip implemented in the sensor tip. Pascal DCT is also able to measure the ocular pulse amplitude (OPA) – the diastolic/systolic fluctuation in IOP caused by changes in pulsatile choroidal blood circulation. There are no clear-cut normal ranges of OPA. Studies have shown several conditions influencing this parameter, e.g. arrhythmia, same surgical procedures and others. The aim of this study was to evaluate the influence of 2 chosen bio-

metric parameters: central corneal thickness (CCT) and ocular axial length (AXL) on intraocular pressure (IOP) and ocular pulse amplitude (OPA) in POAG patients and healthy subjects.

Material and Methods: 57 primary open-angle glaucoma patients and 108 healthy subjects were included in this prospective, non-randomised clinical study. One (right) eye in each subject was evaluated. AXL was measured with non contact immersion biometry and CCT was measured using ultrasound pachymetry. Intraocular pressure and ocular pulse amplitude measurements were performed with Pascal Dynamic Contour tonometer.

Results: Several significant correlations were found. In the group of healthy subjects – AXL/IOP 0.374 (T-test, Pearson, $p = 0.01$), AXL/OPA -0.514 (T-test, Pearson, $p = 0.01$), AXL/IOP 0.211 (Tau b Kendall, Pearson, $p = 0.05$), AXL/OPA -0.335 (Tau b Kendall, Pearson, $p = 0.01$). In the POAG group – AXL/OPA -0.435 (T-test, Pearson, $p = 0.01$), IOP/OPA 0.504 (T-test, Pearson, $p = 0.01$), AXL/OPA -0.362 (Tau b Kendall, Pearson, $p = 0.01$), IOP/OPA 0.299 (Tau b Kendall, Pearson, $p = 0.01$).

Conclusion: We found that axial length of the globe seriously influences ocular pulse amplitude readings. Regarding this finding, one must consider it, while interpreting OPA values in patients with atypical AXL. Correlation of IOP measurements with AXL in healthy subjects needs further studies, we found no explanation of this relationship. Individually different central corneal thickness does not affect IOP nor OPA readings in both groups.

P168 CLINICAL AQUEOUS HUMOR DYNAMIC EFFECTS OF 360- DEGREE SELECTIVE LASER TRABECULOPLASTY (SLT)

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Background: Numerous studies have compared the efficacy of 180° vs 360° primary Selective Laser Trabeculoplasty (SLT). This study sought to demonstrate the aqueous humor dynamic effects of using 360° SLT on aqueous dynamics parameters in patients with primary open-angle glaucoma (POAG) or ocular hypertension (OHT).

Methods: A prospective, non-controlled study on 18 eyes (9 OHT and 9 POAG). All patients were followed for three months following laser treatment. Patients with intraocular pressures (IOP) > 21-35 mmHg were treated with 360° SLT after an assessment that included baseline measurement of IOP, tonographic outflow facility and morning aqueous humor production, using an electronic Schiøtz tonometer to measure the outflow facility of the eye. The aqueous flow rate was measured by fluorophotometry and a pneumotonometer was used to measure the IOP.

Results: The mean age of the study population was 56.72 ± 12.41 years. Three months after SLT treatment, there was a significant reduction in IOP from baseline, with a 21% reduction from 24.04 ± 3.07 mmHg to 18.98 ± 2.76 mmHg ($p < 0.001$). The tonographic outflow facility showed a 55% increase in outflow from 0.09 ± 0.05 $\mu\text{L}/\text{min}/\text{mmHg}$ to 0.14 ± 0.08 $\mu\text{L}/\text{min}/\text{mmHg}$ ($p = 0.003$). No statistically significant changes in aqueous humor production ($p = 0.46$).

Conclusions: Although no significant effects on the aqueous flow rate were found, results using 360° SLT demonstrate

that it lowered the IOP by increasing outflow through the trabecular meshwork.

Clinical Examination Methods: Biomicroscopy (Slitlamp)

P169 THE REPRODUCIBILITY OF THE DISC DAMAGE LIKELIHOOD SCALE (DDLs) IN OPTIC NERVE EVALUATION

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Background: The disc damage likelihood scale (DDLs) is a new method of clinical disc evaluation that considers disc size and rim thinning. The objective of this study is to determine and compare the inter-observer and intra-observer agreement using the DDLs and the vertical cup-to-disc ratio (VCD) as tools to evaluate the optic disc.

Methods: This is an institutional observational case series wherein the inter-observer and intra-observer agreement using two optic disc grading systems (DDLs and VCD ratio) were measured by two observers in three sessions grading 41 eyes of 24 patients. Percent agreement and Kappa statistic were calculated for both the inter- and intra-observer agreement for each of the grading systems.

Results: Mean inter-observer agreement was 51% (DDLs) and 40% (VCD). Kappa for inter-observer agreement using the DDLs was fair to moderate (0.570, 0.345, 0.251). Kappa for inter-observer agreement using the VCD ratio was fair (0.298, 0.281, 0.264). Mean intra-observer agreement (observer 1) was 54.7% (DDLs) and 62.7% (VCD). Mean intra-observer agreement (observer 2) was 50.3% (DDLs) and 41.3% (VCD). Kappa for intra-observer agreement using the DDLs (observer 1) was moderate (0.505, 0.489, 0.416); for observer 2 was fair to moderate (0.438, 0.290, 0.308). Kappa for the intra-observer agreement using the VCD ratio (observer 1) was moderate to substantial (0.496, 0.616, 0.495); for observer 2 was fair (0.313, 0.383, 0.372).

Conclusion: Utilizing the DDLs revealed consistently higher inter-observer agreement compared to the VCD ratio in optic nerve evaluation however, intra-observer agreement utilizing the DDLs had less consistent agreement compared with utilizing the VCD ratio.

Clinical Examination Methods: Gonioscopy

P170 CLASSIFYING JUVENILE ONSET PRIMARY OPEN-ANGLE GLAUCOMAS BASED ON GONIOSCOPIC FEATURES

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Background: Gonioscopic features in eyes with juvenile

onset primary open-angle glaucoma (JOAG) include, prominent iris processes, a high insertion of the iris or a featureless angle that appears like a membrane. The aim of our study was to evaluate the frequency of gonioscopic anomalies in eyes with juvenile onset open-angle glaucoma and relate them with clinical characteristics.

Methods: Goniophotographs of 73 JOAG patients were evaluated. Age at presentation, baseline IOP, visual field defect (mean deviation) at presentation and the treatment needed to control IOP were analyzed and correlated with the gonioscopic features.

Results: Of 73 patients, 25 had a normal looking open angle; group 1 while 48 were classified into Group 2 (36 with high iris insertion and or prominent iris processes and 12 with a featureless angle). Those in group 2 presented with a higher mean IOP (43.5 ± 14.3 vs 34.4 ± 12.2 ; $p = 0.04$) and greater visual field defect compared to those in group 1 (MD -25.5 ± 10.5 VS -14.8 ± 13 dB; $p = 0.009$). The odds of the eyes in group 2 presenting with an untreated IOP > 35 mmHg was 11.5 (CI 2-65), presenting with a MD worse than -18 dB was 5.1 (CI 1.1-22.1) and requiring surgical reduction of IOP was 15.1 (CI 1-148) compared to group 1.

Conclusions: JOAG can be gonioscopically sub classified as those with a normal appearing angle or those with gonioscopic abnormalities such as a high iris insertion or a featureless angle. The latter are more likely to present with higher baseline IOP, greater visual field defect and needing surgery to control their IOP.

Clinical Examination Methods: Ophthalmoscopy

P171 MORPHOMETRIC DIFFERENCES BETWEEN CONGENITAL, JUVENILE AND ADULT ONSET PRIMARY OPEN-ANGLE GLAUCOMA OPTIC DISCS USING SCANNING LASER OPHTHALMOSCOPY

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Background: No study has compared the morphometric features of optic disc in the eyes of congenital, juvenile and primary open-angle glaucoma (POAG) patients. We aimed to evaluate the morphometric features of the optic disc in congenital glaucoma and juvenile onset open-angle glaucoma (JOAG) patients and compare these with adult onset open-angle glaucoma optic discs using scanning laser ophthalmoscopy (HRT3).

Methods: Optic discs of 25 congenital glaucoma, 146 bilateral juvenile onset and 142 adult onset POAG eyes were morphometrically compared using the HRT 3. One eye of each patient was analysed in the study.

Results: Congenital glaucoma and JOAG discs were significantly larger in size compared to adult POAG (2.9 ± 0.92 mm² and 2.6 ± 0.5 mm² vs 2.4 ± 0.57 mm²), had greater cup area (1.68 ± 0.78 mm² and 1.49 ± 0.56 mm² vs 1.32 ± 0.63 mm²) and a greater horizontal cup disc ratio (0.81 ± 0.10 and 0.77 ± 0.14 vs 0.72 ± 0.17). JOAG had a significantly greater cup volume (0.61 ± 0.40 mm³ and 0.62 ± 0.46 mm³ vs 0.48 ± 0.53 mm³), greater cup depth (0.34 ± 0.16 mm and 0.42 ± 0.16

mm vs 0.36 ± 0.14 mm) and greater cup disc area ratio (0.56 ± 0.16 and 0.57 ± 0.17 vs 0.52 ± 0.17) compared to adult POAG discs. However there was no significant difference in the rim area (1.26 ± 0.55 mm² and 1.13 ± 0.48 mm² vs 1.12 ± 0.38 mm²), RNFL thickness (0.12 ± 0.12 mm and 0.17 ± 0.09 mm vs 0.15 ± 0.11 mm), and vertical cup disc ratio (0.68 ± 0.19 and 0.71 ± 0.15 vs 0.69 ± 0.15) between the three groups.

Conclusions: The discs of congenital glaucoma patients and those with juvenile onset primary open-angle glaucoma are larger in size than adult POAG discs. Possibly due to higher IOP, JOAG and congenital glaucoma discs have a greater cup area. The greater horizontal cup disc ratio compared to adult POAG discs in JOAG and congenital glaucoma discs is indicative of a concentric enlargement of the cup.

Clinical Examination Methods: Visual Field Examination and Other Visual Function Tests

P172 COMPARISON OF MACULAR SENSITIVITY IN EARLY AND MODERATE STAGE OPEN-ANGLE AND ANGLE-CLOSURE GLAUCOMA WITH MICROPERIMETRY

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Background: Glaucoma has traditionally been thought to affect peripheral visual function in its early stages and to spare central visual function until late in the disease process. Recent investigations of central visual functions and macular structures in glaucoma have challenged this assumption. Fundus perimetry (also known as microperimetry) innovated recently is a precise, functional test that quantifies differential light threshold at selected areas. Several studies demonstrated that microperimetry can detect more subtle glaucoma functional damage than standard automated perimetry. Previous studies of macular structure and function in glaucomatous eyes included mostly participants with POAG. Primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG) are the two main types of primary glaucoma with different mechanism and different clinical course. It has been speculated increase intraocular pressure (IOP) is the proximal cause of damage in PACG, but that other factors may predominate in at least some patients with POAG. In the present study, we will investigate and compare the macular sensitivity on early and moderate stages POAG and chronic PACG patients with fundus perimetry.

Methods: A total of 126 eyes from 113 subjects including 53 normal eyes, 50 POAG eyes and 23 CACG eyes were prospective enrolled in this study. Subjects with Mean defect (MD) of the standard automatic perimetry (SAP) no worse than 10 dB were enrolled in this study. Macula 10° program with 40 stimuli was performed with MP-1 microperimetry. The mean sensitivity of central 1°, 3°, and 5° visual field were calculated and compared among POAG, CACG, and normal controls respectively. Correlation analysis between mean sensitivity in MP-1 and mean defect in SAP was performed.

Results: The average light sensitivity at central 1°, 3°, 5°, and total macular area in POAG patients was significantly decreased compared to normal controls, respectively ($p = 0.000$, $p = 0.000$, $p = 0.000$, $p = 0.004$). The average sensitivity at central 3° ($p = 0.004$), 5° ($p = 0.013$) and total ($p = 0.024$) in CACG patients were significantly declined compared to normal controls. However no significant difference at central 1° was observed in CACG patients ($p = 0.145$) compared to normal controls. Macular sensitivity was significantly correlated with mean defect in SAP in POAG ($p < 0.05$ at central 3°, 5° and total area respectively). But this correlation was only found at central 5° in CACG ($p < 0.05$). The macular sensitivity in MP-1 was significantly correlated to the mean defect in SAP in quadrants in POAG group ($p < 0.01$ in four quadrants respectively), but no correlation was found in CACG group ($p > 0.05$ in four quadrants respectively).

Conclusions: The amount of macular sensitivity reduction is different between POAG and CACG, which provides new evidence to the different pathogenesis between POAG and CACG.

P173 PATTERNS OF VISUAL DYSFUNCTION IN GLAUCOMA IN DIFFERENT AGE GROUPS

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Background: The pathogenesis of glaucoma depends on the onset of glaucoma. Congenital glaucoma is different from juvenile and adult-onset glaucoma whether it is high pressure or normal pressure glaucoma. Visual field examination is an indispensable tool for diagnosis of glaucoma and the visual dysfunction that accompanies it.

Methods: 80 glaucoma patients were examined and their visual fields were plotted using Octopus 101 Automated Perimetry white on white test. Patients were classified as 20 cases of congenital glaucoma, 10 cases of juvenile glaucoma, 30 cases of open-angle glaucoma and 20 cases of normal-tension glaucoma.

Results: Visual field examination of the patients revealed no significant differences in the mean deviation and loss variance among the different groups but the pattern of field loss was different in age groups and it was well correlated to the pathogenesis and natural disease history.

Conclusion: Visual field examination is an essential diagnostic tool in glaucoma. It shows the pattern of visual dysfunction in glaucoma patients and helps us to understand the pathophysiology of this disease with many enigmatic aspects.

P174 A NEW GLAUCOMA STAGING SYSTEM BASED ON VISUAL FIELD INDEX

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Background: We newly developed a simple glaucoma staging system (GSS) comprised of stages 0 to 5 which are divided into visual field index (VFI) and retinal sensitivity within central 5° on the basis of Bascom Palmer GSS. The purpose of this study is to present the new GSS and to assess its staging performance.

Methods: 725 eyes of 486 glaucoma patients were enrolled

in this study. The VFI cut-off values of the stages 1 to 4 were derived from Receiver Operating Characteristic curve on basis of mean deviation criteria in Bascom Palmer GSS, and also, the staging criteria of stages 0, 5, and central retinal sensitivity are referred to Bascom Palmer GSS. The staging performance of new GSS was assessed in kappa coefficient (κ), and additionally, unmatched patients were studied further.

Results: The calculated cut-off values of VFI was 81.5% between stages 1 and 2 (area under the curve: AUC = 0.972), 62.5% between stages 2 and 3 (AUC = 0.960), and 40.5% between stages 3 and 4 (AUC = 0.983). The new GSS and Bascom Palmer GSS classified 8 eyes each into stage 0, 187 and 105 eyes into stage 1, 133 and 188 eyes into stage 2, 185 eyes and 226 into stage 3, 198 and 184 eyes into stage 4, and 14 eyes each into stage 5, respectively. The new GSS somewhat agreed with Bascom Palmer GSS ($\kappa = 0.745$). When classifying all patients by the new GSS, 69 out of 82 eyes (84.1%) in stage 1 and 16 out of 29 eyes (55.2%) in stage 2, which did not match for their stages, were recognized to be overestimated while 20 out of 20 eyes (100%) in stage 4, which did not match for their stage, were recognized to be underestimated with Bascom Palmer GSS.

Conclusion: The new GSS can be easily applied and more practical compared with Bascom Palmer GSS as the new system considerably reduces overestimation or underestimation of visual field defects.

P175 RISK OF WIPE-OUT PHENOMENON AFTER TRABECULECTOMY WITH RELEASABLE SUTURES WITH MITOMYCIN-C IN ADVANCED GLAUCOMA WITH TUBULAR FIELDS AND SPILT FIXATION

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Aim: To study the risk of wipe-out phenomenon after Trabeculectomy with releasable sutures with mitomycin-C in advanced glaucoma with tubular fields and spilt fixation

Method: In a prospective study, patients with POAG, PACG, juvenile open-angle glaucoma, pseudoexfoliation glaucoma and elevated episcleral venous pressure glaucoma who had uncontrolled IOP with maximum medical management were included. 50 eyes of 39 patients with advanced disc damage showing tubular fields with split fixation on filed analysis (Humphrey 30-2 and Macular threshold test) underwent trabeculectomy with releasable sutures with mitomycin-C. These patients were evaluated post operatively for fall in IOP, maintenance of aided distant and near visual acuity, any progression of defect on the same field tests as done pre-operatively to assist the risk of wipe-out phenomenon.

Results: After 1 and 3 months post operatively, mean reduction of IOP was 14.83 (58.82%) mmHg, macular threshold test did not show any deterioration in the threshold values. No case of wipe out phenomenon was recorded.

Conclusion: As the incidence of wipe out phenomenon is rare, trabeculectomy with releasable suture with mitomycin-C can be safely considered as a treatment option in advanced glaucoma with tubular fields and spilt fixation.

P176 COMPARISON OF LATANOPROST, BRIMONIDINE TARTRATE AND BIMATOPROST PLUS TIMOLOL MALEATE FIXED COMBINATIONS

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Background: To compare the intraocular pressure (IOP) lowering efficacy of latanoprost 0.005% – timolol maleate 0.5% fixed combination, brimonidine tartrate 0.2% – timolol maleate 0.5% fixed combination and bimatoprost 0.03% – timolol maleate 0.5% fixed combination and to evaluate the changes in visual field.

Methods: This study was performed retrospectively. Fifteen eyes receiving latanoprost 0.005% – timolol maleate 0.5% fixed combination, 14 eyes receiving brimonidine tartrate 0.2% – timolol maleate 0.5% fixed combination and 6 eyes receiving bimatoprost 0.03% – timolol maleate 0.5% fixed combination were included in the study. No subject had any systemic or ocular disease except glaucoma that could effect IOP or visual field test. All subjects used anti-glaucoma drugs for a mean period of 12.54 ± 8.4 months (4 months – 26 months). Intraocular pressure was measured using Goldmann applanation tonometer and visual fields test was performed using Humphrey visual field analyzer. Examinations were performed before the initiation of anti-glaucoma drugs and at the end of follow-up period. Results were compared using Kruskal-Wallis test and Wilcoxon test and p values lower than 0.05 were determined to be significant.

Results: Latanoprost 0.005% – timolol maleate 0.5% fixed combination, brimonidine tartrate 0.2% – timolol maleate 0.5% fixed combination and bimatoprost 0.03% – timolol maleate 0.5% fixed combination significantly reduced IOP as compared with baseline (from 21.2 ± 2.2 mmHg to 16.2 ± 3.3 mmHg, from 20.3 ± 3.1 mmHg to 16.3 ± 2.5 mmHg, and from 25.8 ± 3.8 mmHg to 16.8 ± 2.4 mmHg respectively). There was no difference in the IOP lowering efficacy among three groups ($p = 0.084$). Significant improvement in visual field was seen in subjects using latanoprost 0.005% – timolol maleate 0.5% fixed combination and in the group receiving brimonidine tartrate 0.2% – timolol maleate 0.5% fixed combination whereas there was no significant change bimatoprost 0.03% – timolol maleate 0.5% fixed combination (for mean deviation $p = 0.003$, $p = 0.028$, $p = 0.40$ respectively). **Conclusion:** All three fixed combinations have similar IOP lowering efficacy whereas the effect of latanoprost 0.005% – timolol maleate 0.5% fixed combination on visual field is more pronounced. The effects of fixed combinations on visual field need to be evaluated in larger and prospective series.

P177 A COMPARISON OF FOCAL AND NOISE-CORRECTED GLOBAL CHANGE OF AUTOMATED VISUAL FIELDS

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Background: There is a clinical need to quantitate the relative contributions of diffuse and focal change to glaucomatous visual field progression. (Capioli, J AJO 2008, 145, 191; Artes, P et. al Archives of Ophthal 2010, 128, 1528; Richards et. al ARVO 2010 Abstract # 5497; EGS 2010 Poster # P2.51). We have compared noise-corrected maximum-likelihood (NCML) global progression of the Zeiss-Humphrey (ZH) parameter Total Deviation (TD) with focal progression as measured by the ZH parameter Pattern Deviation (PD).

Methods: We retrospectively analyzed 92 ZH 24-2 Sita-Standard Visual Fields of 10 eyes of 10 glaucoma patients.

There were 7 to 11 serial VF's per eye extending over 4 to 8 years. Mean Defect (MD) ranged from -19 to 0. All eyes had corrected acuities of 20/40 or better and combined false positive and false negative error rates of < 20%. We calculated the NCML global slope in db/year (abstract submitted to ARVO 2011) of TD for the 10 eyes and compared this with slope of the standard deviation (as a measure of focal irregularity) of PD (abbreviated SDDP).

Results: Slope of SDDP and negative slope by NCML were well correlated (Pearson $r = 0.861$). By Mann-Whitney U Test, the two sets of slopes were not statistically different ($p = 0.322$). By T-Test, none of the 10 pairs of slopes differed at the $p = 0.05$ level.

Conclusions: NCML analysis reduces the noise of TD progression analysis and makes it possible to quantitatively compare slopes, in db/year, of global and focal VF change. In the present limited study, we found that global slope by NCML and focal slope by SDDP are essentially equivalent.

P178 FREQUENT LOCATION OF VISUAL FIELD DEFECTS IN GLAUCOMA SUSPECTS AS EVALUATED BY SITA-SWAP

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Background: Short wavelength automated perimetry (SWAP) can predict visual field defects in glaucoma patients earlier than standard white-on-white perimetry. SITA-SWAP is a novel strategy that reduces test time. The purpose of the study was to ascertain the preferential location of visual field defects in glaucoma suspects as detected by SITA-SWAP.

Methods: SITA-SWAP reliable exam printouts of 86 eyes from 43 patients with suspicious optic discs were analyzed. All 52 non-blind spot locations in the 24-2 SITA-SWAP were clustered into six areas corresponding to six topographic sectors of the optic disc (supero-temporal, supero-nasal, temporal, infero-nasal, infero-temporal and nasal). Number of points depressed ($p < 5\%$) on the pattern deviation probability plot in each of the six areas were recorded and adjusted by the total number of points in each area. The frequency of depressed points was compared among all areas.

Results: The visual field area with higher number of depressed points was that corresponding to the infero-temporal aspect of the disc (21.4%), whereas the area with less depressed points was that corresponding to the nasal aspect of the disc (1.7%).

Conclusion: The inferior hemifield seems to be the preferential location of visual field defects in glaucoma suspects as evaluated by SITA-SWAP. This observation helps differentiate possible artifacts from highly possible visual field defects.

P179 EFFICACY OF FUNDUS-ORIENTED PERIMETRY FOR DETECTION OF VISUAL FIELD ABNORMALITIES IN PRE-PERIMETRIC GLAUCOMA

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Background: Conventional automated perimetry threshold examinations have a relatively low spatial resolution with 6 degrees separating adjacent test locations. The sparse number of the test points may be one of the reasons why glaucomatous visual field defects are not detected in eyes with pre-perimetric glaucoma. Therefore, the aim of this study is to report the usefulness of Kowa AP-6000 (Kowa, Japan), fundus-oriented perimetry, for detection of visual field abnormalities in retinal nerve fiber layer defect (RNFLD) area in eyes with normal standard automated perimetry (pre-perimetric glaucoma).

Methods: Twenty-two eyes of 22 pre-perimetric glaucoma subjects who had glaucomatous optic disc abnormalities with a localized RNFLD were included in this study. None of reliable Humphrey Field Analyzer (HFA) test results showed glaucomatous visual field defects, which were determined according to Anderson's criteria. Reliable HFA test results were defined as a false-positive error < 15%, a false-negative error < 15%, and a fixation loss < 20%. All subjects had complete ophthalmic examinations and had to meet the following criteria: best corrected visual acuity \geq 1.0, with a spherical error within ± 6.0 D and a cylinder error within ± 3.0 D. AP-6000 is a fundus oriented perimetry with a picture of the subject's fundus presented upside-down automatically on the screen and the examiner should arrange the image by pointing to the fovea centralis and the center of the optic disc. A test area was set in the upper and lower hemifields on the fundus image displayed on the monitor. The RNFLD was included in the test area. The arbitrary test point can be added, if needed. The sizes of the targets were Goldmann III. Target color was white and background luminance was 31.5 asb. Exposure duration was 200 ms. The Bracketing method was used as a test strategy. All subjects underwent AP-6000 within 3 months before or after HFA test, and were diagnosed according to the following criteria: Criteria 1: having a cluster of three or more points with 5 dB or more decrease in sensitivity with at least one point with 10 dB or more decrease in RNFLD area; Criteria 2: having a cluster of three or more points with 5 dB or more decrease in sensitivity in RNFLD area; Criteria 3: having a cluster of two or more points with 5dB or more decrease in sensitivity with at least one point with 10 dB or more decrease in RNFLD area.

Results: The sensitivities of each criterion are Criteria 1: 22.7% (5/22), Criteria 2: 31.8% (7/22), Criteria 3: 22.7% (5/22), respectively. There were no decrease in sensitivity fulfilled any of those criterion outside RNFLD area.

Conclusion: The fundus-oriented perimetry may be a useful method to detect visual field abnormalities in pre-perimetric glaucoma.

P180 THE VISUAL FIELD CHANGES FOLLOWING UNILATERAL ACUTE ANGLE CLOSURE ATTACK IN PRIMARY ANGLE-CLOSURE GLAUCOMA PATIENTS

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Purpose: To analyze visual field (VF) changes in eyes with unilateral acute angle-closure glaucoma attack (AACG) in primary angle-closure glaucoma (PACG) patients and identify risk factors at presentation for VF change after acute attack.

Patients and Methods: In this retrospective case series analysis on data from Taiwan, from January 2000 and Octo-

ber 2009, we evaluated VF change in eyes with AACG and the contralateral eyes without acute attack (CACG). Also, risk factors for VF progression in AACG were analyzed.

Results: Eyes of 88 patients were reviewed. All patients had one eye in the AACG group, the contralateral eye in the CACG group. Mean follow up was 28 months (range, 24-32 months). Mean deviation (MD) and corrected pattern standard deviation (CPSD) showed severity of VF change increased significantly with time ($p < 0.001$). However, MD value differed significantly at 6 and 9 months after the acute attack ($p < 0.05$). After resolution of the acute attack in AACG group, higher baseline intraocular pressure (IOP), worse baseline MD and age were statistically significant risk factors for VF progression.

Conclusions: The AACG group had worse VF progression than CACG at 6 and 9 months follow up. Physicians should closely monitor patients with AACG during follow up, especially those with identified risk factors.

Keywords: acute primary angle closure, angle closure, visual field.

P181 FACTORS IN THE VARIATION OF RETINAL NERVE FIBER LAYER BUNDLE ANGLE

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Background: In glaucoma, the correspondence between the functional changes of the visual field and the structural changes of the optic disc is important for the diagnosis of the disease. Polar graph is a visual field representation that can clearly represent this correspondence. Based on an anatomical pattern of the retinal nerve fiber layer (RNFL), polar graph determines the RNFL bundle angles at the optic disc and rearranges the result of each test location of the G2 program around the optic disc. However, the bundle angles can be influenced by many factors. In this study, we measured the RNFL bundle angles and investigated the factors in the variation of the bundle angle.

Methods: Subjects were 36 eyes of 36 subjects (10 males and 26 females; average age, 39.5 ± 14.0 years) including 7 glaucomatous eyes and 29 normal eyes. All the subjects had spherical equivalent (SE) of -10.5 D to $+0.25$ D. Each subject's fundus images were taken by the scanning laser ophthalmoscope (SLO, F-10, NIDEK) with a blue laser (490 nm) and the SLO images were averaged using the software tracking method Registax V4.0 to construct a clear 60° RNFL bundle image. We also detected the subject's blind spot using the custom test of the Octopus 900 with 1° intervals. The G2 test program with the found blind spot was inverted to match the blind spot to the optic disc on the RNFL bundle image for comparison. We traced the trajectories of the RNFL bundle from each test location to the optic disc and subsequently measured the bundle angle at the optic disc for each test point. In this study, four factors were considered relevant to the variation of the bundle angle: SE, axial length (AL), the angle formed by the line passing through the fovea and the optic disc and the horizontal line passing through the fovea (the fovea-optic disc angle), and the angle formed by the central superior and inferior temporal retinal arteries (the

temporal retinal artery angle). We investigated their correlations with the bundle angle.

Results: All the test points had a standard deviation of the RNFL bundle angle between 8.7° and 16.9°. Except the AL, the other three factors correlated with the bundle angle. Particularly, the correlations with the bundle angle were observed in the temporal visual field for SE, within the visual field 15° from the fixation point for the fovea-optic disc angle, and in the nasal visual field for the temporal retinal artery angle.

Conclusion: Our results indicated an average individual difference of about 12 degrees in the bundle angle. In addition, the bundle angle could be affected by SE, the fovea-optic disc angle, and the temporal retinal artery angle.

P182 EVALUATION OF THE ALGORITHM TO PREVENT SPIKES-SHAPED ISOPTERS IN FULLY AUTOMATED KINETIC PERIMETRY

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Background: In automated kinetic perimetry, spikes-shaped isopters that indicate deviations from normal kinetic results because of response variability are often observed. To prevent or minimize such events, we developed a new algorithm and evaluated its effect on Program K, our fully automated kinetic perimetry, in virtual patients.

Methods: Goldmann manual kinetic perimetry (MKP) was performed on 100 eyes of 100 patients (average age, 57.1 ± 16.7 years; 63 eyes with glaucoma, 24 eyes with neuro-ophthalmological diseases, and 13 eyes with retinitis pigmentosa). Depending on the characteristic of their visual field changes, the patients were classified into two groups: Group I with flat changes and Group II with steep changes. The obtained isopters were digitized in K-Train (an Octopus kinetic perimetry training software developed by Tübingen University) to be used on 100 virtual patients. Program K was then performed on the 100 virtual patients using target sizes of V/4e, III/4e, I/4e, I/3e, I/2e, and I/1e at a speed of 3 degrees/sec to assess the visual field loss. With K-Train, the virtual patients' false-positive (FP) rates, false-negative (FN) rates, scatter in the frequency-of-seeing (FOS) curve, and scatter of reaction times were adjustable. By assessing FP and FN rates, the number of vectors, test durations, scatter in the FOS curve and scatter of reaction times, we examined the association between the results of Program K and the Goldmann MKP.

Results: If both the FP and FN rates were less than 20%, the isopters obtained by Program K were comparable to those by the Goldmann MKP. If the FP and FN rates were equal to or higher than 20% and the number of vectors and test durations also increased significantly, spikes were observed in some of isopters obtained by Program K. However, if Group I and II had a scatter in the FOS curve in K-Train respectively less than 0.7 and 0.9 and the scatter of reaction times was less than 0.4, the isopters from Program K were comparable to those by the Goldmann MKP. This indicated the effect of the new algorithm on Program K for eliminating the spikes in the isopters and the effect had resulted in comparable results by both methods.

Conclusion: By simulating the spikes-shaped isopters on the virtual patients, we have shown that the algorithm in Program K could reduce spikes in the isopters and optimize the use of Program K.

P183 CLINICAL USEFULNESS OF HEIDELBERG EDGE PERIMETER

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Background: Heidelberg Edge Perimeter (HEP) that uses a new stimulus called Flicker-Defined Form (FDF) to selectively stimulate the magnocellular system is developed to detect early glaucoma. The test consists of flickering random dots on a mean luminance background (50 cd/m²). The 5-degree circular stimulus is created by a phase reversal of the black and white dots that flicker in counterphase to the background dots at a temporal frequency of 15 Hz. The counterphase flickering black and white dots create an illusory 'edge' that the patient perceives as a gray patch or a circle against the mean luminance background. In this study, we evaluated the clinical usefulness of HEP.

Methods: Subjects were 32 eyes of 32 patients with glaucoma (average age, 53.5 ± 10.9 years) and 20 eyes of 20 normal subjects (average age, 42.0 ± 10.0 years). All the subjects underwent Standard Automated Perimetry (SAP) using the Humphrey Field Analyzer (HFA) 24-2 SITA-Standard strategy, Short Wavelength Automated Perimetry (SWAP) on the HFA using 24-2 SITA-SWAP strategy, flicker perimetry on the Octopus 311 (4-zone probability 38S), Frequency Doubling Technology (FDT) on the Humphrey Matrix with 24-2 threshold, and HEP using 24-2 AS-TA-Standard strategy. Glaucomatous eyes were graded on the basis of the Hodapp-Anderson-Parrish Criterion: 5 eyes with preperimetric glaucoma, 9 eyes with early stage of glaucoma, 7 eyes with moderate stage of glaucoma, and 11 eyes with advanced stage of glaucoma. The visual field was evaluated using the number of abnormal points. The cutoff criterion for defining a point as abnormal corresponded to a sensitivity equal to or worse than the normal 5% probability level for an age-similar group. The areas under the receiver operating characteristic curves (AUCs) were calculated to assess the detectability of glaucoma.

Results: The AUCs in HEP using the total deviation were 0.70 in preperimetric and early glaucoma, 0.85 in moderate glaucoma, and 0.87 in advanced glaucoma. The AUCs in HEP using the pattern deviation were 0.76, 0.86, and 0.95 in preperimetric and early, moderate, and advanced glaucoma, respectively; which were similar to those in SWAP and FDT. The specificity of HEP was 25% with the total deviation and 55% with the pattern deviation.

Conclusion: HEP appeared to be a useful method for detecting early glaucoma. However, the normal data in HEP might need to be reconsidered because the AUC with the total deviation had a lower value than the AUC with the pattern deviation. In addition, the flickering stimulus and background along with the changing contrast might have increased the difficulty of the test and caused the low specificity of HEP.

P184 RELATIONSHIP OF THE THRESHOLD VALUES BETWEEN THE KINETIC TARGET AND STATIC TARGET

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Background: One of the important objectives of the visual field testing is the evaluation of quality of vision (QOV) of visually disabled people. For the evaluation of severe cases of visual field disorders, kinetic perimetry using the Goldmann perimeter (GP) is as useful as static perimetry with the automated perimeter. However, it is well known that there exists divergence between threshold values of kinetic perimetry and those of static perimetry even under the same conditions. In this study, we investigated the relationship of static perimetric threshold and kinetic threshold with kinetic targets under the corrected reaction time (RT) with a specific constant target speed using the automated perimeter.

Methods: The subjects were 8 eyes of 8 healthy youths (6 males and 2 females; average age: 30.5 years). Each of the 4 quadrants was measured with the automated perimeter, Octopus®900, Goldmann kinetic perimetry (GKP), using the target speed of 3 degrees/sec and the size and luminance of V/4e, III/4e, I/4e, I/3e, I/2e, I/1e. When deciding threshold values, the RT was corrected. Static perimetry was performed using a custom test program with the normal strategy and stimulus size 3 on the meridians where the kinetic perimetry was carried out. The measuring points were arranged with distance of 2 degrees to one another, and threshold values were measured and compared with those of the points which corresponded to the points where response was obtained in GKP.

Results: The threshold value of $\delta/4e$ obtained with kinetic targets corresponded to the static threshold value of 9.2 \pm 5.0 dB. Likewise, the threshold values of I/4e, I/3e, I/2e, and I/1e corresponded to the static threshold values of 15.8 \pm 3.2 dB, 19.7 \pm 2.5 dB, 26.3 \pm 2.6 dB and 28.7 \pm 1.9 dB, respectively. The comparison of the kinetic threshold value of $\delta/4e$ and static threshold value was not possible. Kinetic perimetry using stimulus size 1 demonstrated divergence from the photometric harmony based on the theoretical spatial summation compared to the static perimetry using stimulus size 3.

Conclusion: The threshold values obtained using kinetic targets were lower than those with static targets, therefore, photometric harmony based on the simple spatial summation cannot be applied when target sizes are different.

P185 DIAGNOSTIC ACCURACY OF VISUAL FIELD STAGING SYSTEMS FOR CLASSIFICATION OF GLAUCOMA SEVERITY

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Background: Evaluation of glaucoma severity is important both for clinical practice and research purposes. The amount of visual field loss detected by standard automated perimetry (SAP) is widely used method to categorize glaucoma severity. Several visual field staging systems (VFSSs) have been

proposed for the classification of glaucoma severity but there is no general agreement about which of these staging systems is most accurate. The purpose of this study was to compare the diagnostic accuracy of four VFSSs; Brusini Glaucoma Staging System 2 (GSS2), Advanced Glaucoma Intervention Study (AGIS), Collaborative Initial Glaucoma Treatment Study (CIGTS), and Burr's MD VFSS for classification of glaucoma severity.

Methods: Sixty-six consecutive adult patients attending glaucoma clinic were eligible. Only eyes with at least two reliable visual field (VF) tests using central 24-2 Humphrey field analyzer within six months of recruitment and no evidence of anterior segment diseases that obstruct the viewing of the optic nerve were included. Each eye was independently graded into stages of glaucoma severity by an experienced glaucoma specialist (AAB, reference standard), based on a clinical guideline, and a researcher using the selected VFSSs (index tests). A random sample of 15% of study population was independently assessed by another ophthalmologist. Sensitivity, specificity, positive predictive values (PPV) and negative predictive values (NPV) were calculated for each VFSS according to level of glaucoma severity.

Results: One hundred and four VFs were compared but four tests were not included in the analysis of CIGTS VFSS due to corrupted files. In total, 16 eyes were diagnosed to be normal, 24 eyes were mild, 32 eyes were moderate and 32 eyes were severe. The agreement between two ophthalmologists was excellent ($\kappa = 0.88$ [CI, 0.7 to 1.0]). The sensitivity and specificity of the VFSS in grading the visual field according to level of glaucoma severity was highest in AGIS VFSS (37.5%, 77.3%) for normal stage, Burr's MD VFSS (70.8%, 60.0%) for mild stage, Brusini GSS2 (65.6%, 75.0%) for moderate stage and Brusini GSS2 (68.8%, 95.8%) for severe stage. While, sensitivity and specificity was lowest in Burr's MD VFSS (6.3%, 93.2%) for normal stage, AGIS VFSS (16.7%, 57.5%) for mild stage, CIGTS VFSS (20.7%, 73.2%) for moderate stage and CIGTS VFSS (25.0%, 82.4%) for severe stage. Improvement in the performance of VFSS was seen after combining normal and mild visual fields; Burr's MD VFSS (92.5%, 70.3%), Brusini GSS2 (80.0%, 87.5%), AGIS VFSS (90.0%, 56.3%), and CIGTS VFSS (53.9%, 44.3%), sensitivity and specificity respectively.

Conclusion: Staging systems designed for classifying glaucoma severity have limitations. Burr's MD VFSS appears to be useful in staging mild disease, while, Brusini GSS2 is useful in staging moderate and severe disease. Overall performance was improved by combining normal and mild disease. Using VFSS as the sole criteria of classifying glaucoma severity is still insufficient in classification of glaucoma severity.

P186 ADJUSTING FOR VISUAL ACUITY TO REMOVE THE POTENTIAL CONFOUND OF CATARACT DEVELOPMENT WHEN ASSESSING VISUAL FIELD CHANGE IN EARLY GLAUCOMA

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Background: Automated perimetry remains the gold standard for functional testing in glaucoma. However, contrast sensitivity (perimetric sensitivity) is affected not just by glau-

coma, but also by developing cataract. The Visual Field Index (VFI) aims to provide a global index that is less affected by cataract development. However, it is insensitive to early glaucomatous change, signaling '100% of normal vision' even when generalized loss or very early localized loss are present. This study aims to identify predictors of the rate of sensitivity loss after adjusting for potential cataract development, without excluding early glaucomatous change.

Methods: Data were taken from the ongoing Portland Progression Project, a longitudinal study of participants with early or suspected glaucoma. The rate of change of Mean Deviation (MD) over sequences of six visual fields was predicted based on the initial neuroretinal rim area (from confocal scanning laser ophthalmoscopy), intra-ocular pressure (IOP; the maximum recorded during the series), treatment (the proportion of the six visits at which the patient self-reported taking IOP-lowering medication), and the rate of change of logMAR-equivalent visual acuity during the series. A first-order autoregressive multivariate linear generalized estimating equation model was used, to adjust for multiple series from the same participant.

Results: 1232 series of six visits were included, from both eyes of 145 participants, averaging 4.2 series per eye. At their first visit, 84% of participants had VFI > 98; 31% had VFI = 100. Series began with an average MD of -2.0dB; VFI of 98.3; IOP of 18.1 mmHg; and acuity of -0.01 logMAR equivalent. Only 8% had a rate of change of VFI worse than -1/year, while 29% had MD change worse than -0.33dB/year (both approximately 1% of the available range). Rate of change of MD was predicted by Rim Area ($p = 0.003$), rate of change of acuity ($p = 0.027$), Treatment ($p < 0.001$) and IOP ($p = 0.008$). Similar models predicted rate of change of MD using optic nerve head cup volume ($p = 0.001$), and cup-to-disc ratio ($p < 0.001$).

Conclusion: Adjusting for change in visual acuity allows the rate of glaucomatous progression to be assessed, without discarding information about early glaucomatous change. Clinically, considering the rate of change of MD together with acuity may allow better detection of change than using the trend of VFI in early glaucoma.

P187 PATTERN DEVIATION MAY SOMETIMES BE AN UNRELIABLE INDICATOR OF VISUAL FIELD LOSS DUE TO STATISTICAL ARTIFACTS

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Background: Probability maps are widely used for clinical assessment of the visual field. Total deviation (TD) maps indicate differences from age-corrected mean normal values, and PD maps attempt to highlight localized loss by statistically correcting TD maps for overall loss of sensitivity due to factors such as cataract. The aim of the current study was to look for statistical artifacts in pattern deviation (PD) probability maps. Previous studies have found that it is not uncommon to see, in healthy eyes, clusters of locations flagged as defective in PD probability maps [Heijl & Åsman, Perimetry Update 1988-89]. Here, the number of clustered defective locations is compared for TD and PD probability maps, for visually healthy control subjects and patients with glaucoma,

using both standard automated perimetry (SAP) and frequency-doubling perimetry (FDP).

Methods: The most recent pair of reliable SAP and FDP tests was selected for twenty-seven patients and 25 age-similar controls from a longitudinal study. All 52 subjects had good acuity, were experienced with perimetry, and were free from significant cataract or pupillary myosis. Age-corrected TD and PD values were calculated from control data to permit two-tailed analyses and avoid statistical differences between machine norms for the two tests. Cutoff values for suspect-low and abnormal-low sensitive locations were, respectively, the 5th and 1st percentile of the kernel density estimates of distributions for controls. Cutoffs for suspect-high and abnormal-high locations were the 95th and 99th percentile. Suspect and abnormal locations were only included in the analysis if adjoining locations were also suspect or abnormal, i.e. if they were part of an abnormal cluster [Patel et al, Ophthalmology 2007; 114: 480-7].

Results: TD and PD values calculated in reference to study controls were similar to those on machine printouts, typically within ± 1 decibel. Patterns of damage shown in probability maps from TD and PD calculated in reference to control subjects were also similar to patterns in the printouts. TD maps for SAP and FDP showed abnormally low-sensitive clusters for 9 and 6 control subjects, respectively, and abnormally high-sensitive clusters in 5 and 7 subjects. PD maps for SAP and FDP showed abnormally low-sensitive clusters in 11 control subjects and abnormally high-sensitive clusters for 3 and 6 subjects, respectively. These observations lead to the hypothesis that PD has a bias towards abnormally low-sensitive clusters and away from abnormally high-sensitive clusters. Machine printouts for patient data were used to test the prediction that PD increases the number of defective clusters. For both SAP and FDP printouts, 8 patients (30%) had more locations in defective clusters for PD than for TD. The 95% confidence interval for the percentage was from 15% to 48%.

Conclusion: Even though PD was conceived as a means of correcting for diffuse loss, statistical artifacts may occur that introduce bias. Higher number of locations in defective clusters for PD maps than for TD maps seems to occur more frequently than it is commonly thought. In such event, TD may be the more reliable indicator of visual field loss.

P188 EFFECTS OF GLAUCOMA PROGRESSION ANALYSIS IN GLAUCOMA MANAGEMENT

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Background: Visual field tests are important for follow-up of glaucoma. This article was designed to evaluate the effects of Glaucoma Progression Analysis (GPA) and Visual Field Index (VFI) used in Humphrey Field Analyzer perimeter (HFA) in follow-up management of glaucoma patients.

Methods: Retrospective studies of the eyes of glaucoma patients and ocular hypertensive patients were made in at least five reliable central visual field results through 24-2 test of SITA-Fast strategy. Progression of the visual field damage was analyzed by visual field progression scarring criteria of Advanced Glaucoma Intervention Study (AGIS) and analyzing indices of GPA software respectively. Agreement between both methods was quantified by kappa analysis.

Results: There's a significant relevance between the inci-

dence of the progression of visual field damage evaluated by GPA and the one evaluated by clinical scoring criteria. Furthermore, GPA indicated the test point of abnormal variation with simple triangle symbols, and revealed the possible progressions of visual field with the words of 'Likely Progression', 'Possible Progression' or 'No Progression Detected' in progression analysis printouts. GPA indicated the velocity of progressive visual field damages within five years through the regression analysis of VFI relative to age, which give a clear clinical guide to patients for the next therapeutic target.

Conclusions: GPA has an excellent efficiency for evaluation of visual field progression, just like clinical scoring criteria of AGIS, and more sensitive, specific and convenient, which has an important guiding effect on the follow-up of either confirmed or suspected glaucoma patients, or ocular hypertension patients.

P189 COMPARISON OF SITA SWAP, MATRIX FDT PERIMETRY AND SAP FOR DETECTION OF GLAUCOMATOUS VISUAL FIELD DEFECTS

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Backgrounds: To compare the diagnostic performance of standard automated perimetry (SAP), frequency doubling technology (FDT) perimetry, and short wavelength automated perimetry (SWAP) in detecting glaucomatous visual field abnormality.

Methods: One hundred and thirty-two participants (95 glaucoma patients and 37 normal subjects). Each participant had retinal nerve fiber layer (RNFL) imaging by the Cirrus HD-OCT and visual field testing by SAP, Matrix FDT perimetry, and Swedish interactive thresholding algorithm (SITA) SWAP at the same visit. Any visual field defects were confirmed with at least 2 consecutive examinations by the same types of perimetry. RNFL thickness was used as a reference standard to determine whether glaucoma was present. An RNFL thickness deviation map score ≥ 4 was considered glaucomatous and ≤ 2 was considered normal. The diagnostic sensitivity, specificity and the area under the receiver operating characteristic curve (AUC) of MD (mean deviation) and PSD (pattern standard deviation) for detection of visual field abnormality were compared between perimetries.

Results: Taking all glaucoma patients into consideration, the diagnostic sensitivity was highest for Matrix FDT perimetry (69%), followed by SAP (68%) and then SITA SWAP (59%). When the analysis only included early glaucoma patients, the sensitivity reduced to 52%, 46% and 34%, respectively, with a significant difference detected between Matrix FDT perimetry and SITA SWAP ($p = 0.034$). The specificity was $\geq 97\%$ for all perimetries. The AUCs of MD and PSD followed a similar order with Matrix FDT perimetry had the greatest AUC (0.91 – 0.95), followed by SAP (0.88 – 0.94), and then SITA SWAP (0.69 – 0.91). There were significant differences in sensitivities at 90% specificity between Matrix FDT perimetry and SITA SWAP ($p \leq 0.001$ for MD; $p \leq 0.029$ for PSD).

Conclusions: While the diagnostic performance for glaucoma detection was comparable between Matrix FDT perimetry and SAP, Matrix FDT perimetry had a higher sensitivity to detect glaucomatous visual field abnormality than SITA SWAP at a comparable level of specificity.

P190 COMPARISON OF PROGRESSION ANALYSIS IN OCULAR HYPERTENSION AND GLAUCOMA WITH MD AND NEW VFI INDICES

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Background: The Visual Field Index (VFI) is a new indice of evaluation of visual function on standard Humphrey automated perimetry, less sensitive to changes in clarity of ocular media than mean deviation (MD). The aim of this study was to compare results of the progression analysis evaluated by each indices, in ocular hypertension (OHT) and primary open-angle glaucoma (POAG).

Methods: Prospective study of 298 eyes followed 6.6 (± 1.7) years (213 OHT and 85 Early POAG). Each subject performed a mean of 10 standard automated perimetry. VFI, MD and their rate of progression were analyzed and compared.

Results: During follow-up period, in the OHT group, 75% of patients stayed OHT at the end of the study and 25% became POAG. Mean rate of progression in these 2 groups were respectively -0.04%/year and -0.41%/year for VFI, -0.03 dB/year and -0.20 dB/year for MD. Conclusions about progression after statistical trend analysis of the VFI and MD rates of progression were concordant for 84% and 80% of eyes, respectively, in the 2 groups. In the early POAG group, 80% stayed early POAG and 20 % progressed to more severe stages of POAG (MD < -6 dB). Mean rate of progression were respectively -0.39%/year and -3.00%/year for VFI, -0.16 dB/year and -1.14 dB/year for MD. Conclusions about progression after statistical trend analysis of the VFI and MD rates of progression were concordant for 78% and 100% of eyes, respectively, in the 2 groups. VFI and MD rates of progression presented a statistically significant Spearman's rank correlation coefficient ($p < 0.001$), with values of 0.678 for the overall population, 0.620 for the OHT group and 0.707 for the POAG group.

Conclusion: These 2 indices and their progression analysis, both trend analysis, gives always concordant and complementary evaluation of visual field in OHT and POAG. In glaucomatous subjects presenting a rapid progression profile, indices are strongly concordant. The new VFI indice and his rate of progression seems a good quantification of glaucomatous damages on the visual field and of glaucoma evolution.

P191 COMPARISON OF TOP AND NORMAL STRATEGY IN OCTOPUS PERIMETRY

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Aim: Tendency oriented perimetry (TOP) attempts to assess the visual field by using answers to questions to establish thresholds in the neighboring area. The aim of this study was to compare the results of tendency-oriented perimetry (TOP)

and a normal strategy in octopus perimetry as methods in detection of visual field defects in glaucoma patients.

Design: A prospective single center observational case series was performed.

Participants and methods: In a glaucoma department of University Eye Clinic 27 patients (47 eyes) with a glaucoma were examined prospectively with TOP and a normal strategy using the program G1 with the Octopus 500E. All patients had previous experience with an automated visual field tests and visual acuity better than 0.7. The following parameters were analyzed for the two strategies studied: examination time, MS (means sensitivity), MD (mean defect), LV (Loss Variance), test reliability (RF).

Results: Mean age of the patient was 55.70 ± 14.53 years. TOP perimetry showed a significant reduction of exploration time: mean 11.09 ± 0.43 minutes with the normal strategy vs. 2.21 ± 0.43 minutes with the TOP strategy ($p < 0.01$). The average MS was 1 dB higher with normal strategy (25.25 ± 4.57 dB with normal strategy vs. 24.78 ± 4.34 dB with TOP strategy). The average MD with normal strategy was 2.24 ± 4.27 dB and with a TOP strategy was 2.66 ± 3.98 dB. The mean LV tended to be 2 dB higher with normal strategy (16.91 ± 29.19 dB with normal strategy vs. 14.10 ± 25.38 dB with TOP strategy). Correlation coefficient of global indices between both tests was high (for MS $r = 0.95$, for MD $r = 0.98$, for LV $r = 0.98$) and statistically significant ($p < 0.01$). RF was significantly higher with normal strategy than with TOP strategy (8.23 ± 10.59 vs. 3.58 ± 4.92).

Conclusion: The TOP strategy reduces examination time significantly but seems to be less accurate especially for the calculation of the depth of each scotoma in comparison with the standard Octopus G1 perimetry.

P192 VERIFYING THE ACCURACY OF GLAUCOMA HEMI-FIELD TEST (GHT) FOR THE DETECTION OF EARLY GLAUCOMATOUS VISUAL FIELD LOSS: A STUDY

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Background: Glaucoma Hemifield Test (GHT) is more finely tuned to detect a patch of early glaucomatous visual field loss than other global indices. In the GHT, 5 zones in the upper field are compared with the 5 zones in the mirror images locations in the lower field. The zones being constructed in the approximate patterns of retinal nerve fibres, GHT is directed primarily at the diagnosis of glaucomatous visual field loss, and no other disease.

The present study seeks to verify the accuracy of GHT for the detection of early glaucomatous visual field loss in (1) a group of subjects with ocular hypertension (OHT), converting to glaucoma (at the moment of their glaucomatous conversion) from OHT and in (2) a group of Primary Angle Closure (PAC) subjects at the moment of their conversion from PAC to PACG with early localized defects.

Methods: In a retrospective chart review, 125 cases, (248 eyes) from Rotterdam Eye Hospital, Netherlands and Eye & Glaucoma Care, Kolkata, India were included. 121 patients (242 field charts) with OHT (Intraocular Pressure > 22 and < 32 mmHg and normal visual fields) were included along with 4 PAC subjects (6 field charts, Subacute PAC with pupil block, 360 degree appositional angle closure, IOP > 22 and < 28 mmHg, with patent YAG PI, and normal visual fields). 248 reliable field charts (Humphrey Field Analyzer, 24-2 Pro-

gram) were analyzed. All participants were tested once half-yearly for a 4 – 7 year period or until the onset of conversion (study end point). The conversion to glaucoma was defined as a reproducible glaucomatous visual defect in Standard Automated Perimetry. Each field was evaluated by Hoddap-Parrish-Anderson's criteria to detect early localized field defect due to glaucoma. Three criteria for minimal abnormality to determine early glaucomatous defect are: 1) Three or $>$ non – edge adjacent scotomas in pattern deviation probability plot, Two points $p < 5\%$ and one point $p < 1\%$; 2) PSD $p < 5\%$; 3) G.H.T. abnormal. Meeting any one of the criteria, seemingly the most accurate among current practices, is accepted as sufficient to make the test result abnormal. The hemifield analysis is probably the most accurate overall.

Result: 1) Out of 121 subjects with ocular hypertension, 18 converted (23 charts); 2) Out of 4 PAC patients 2 converted to PACG based on the criteria mentioned above. The GHT was not 'Outside Normal Limits' in 6 charts of those converted patients with OHT and in 2 charts of converted PAC cases. GHT interpreted 8 converted field charts (6 from OHT group + 2 from PAC group), out of 25 (23+2) as 'within normal limits' despite the presence of other 2 criteria in all those 8 charts.

Conclusion: Though GHT reportedly the single most effective method of visual field analysis in early glaucoma, visual field evaluation on GHT alone is at significant risk for misinterpretation, under-diagnosis and under-treatment. In OHT and Glaucoma suspects, the defect depth in pattern deviation plot should always be evaluated before any diagnostic/therapeutic decision.

P193 THE CORRELATION BETWEEN VISUAL FIELD INDEX (VFI) VALUE AND MEAN DEVIATION (MD) VALUE OF HUMPHREY FIELD ANALYZER IN GLAUCOMA AND GLAUCOMA SUSPECTS

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Purpose: We examined the correlation between visual field index (VFI) value and mean deviation (MD) value, also examined VFI plot and MD slope as well in glaucoma and glaucoma suspects.

Participants: Primary open-angle glaucoma and ocular hypertension who underwent at least 5 times of SITA standard 30-2 program by Humphrey field analyzer (HFA) U700 model for the certain period. All eyes were analyzed by VFI, VFI plot, MD and MD slope in same visual fields examination.

Methods: The hundred five eyes of sixty cases (male 26 cases 46 eyes – female 34 cases 59 eyes; mean age 57 ± 11.6 y.o.) were enrolled retrospectively. Mean times of HFA examinations were 7.8 ± 1.9 . The correlation of that VFI value and MD value, VFI plot and MD slope were analyzed in all eyes and in the classified eyes according to the pattern of visual field defect [central defect, peripheral defect, mixed (central and peripheral) defect and normal type]. Statistical analysis was performed by generalized-estimating-equation (GEE) model.

Results: As to MD values and VFI values, the significant correlation between those was shown in both of analysis by all eyes and by the eyes according to the types of visual field

defect. The significant correlation between VFI plot and MD slope was shown by the analysis of all cases. However, these significant correlation were shown in peripheral, mixed and normal type of visual field but in central type ($p = 0.509$, $r = 0.180$).

Conclusion: A strong significant correlation was shown in VFI values and MD values and also in VFI plot and MD slope by the analysis of all cases. However, no correlation between VFI plot and MD slope was shown in the eyes with central type of visual field defect. It seems that the evaluation of progression of visual field defect at central area need to be careful attention using these trend analysis.

P194 MICROPERIMETRIC FEATURES IN EARLY GLAUCOMATOUS OPTIC NEUROPATHY

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Purpose: To evaluate microperimetry, MP1, in early glaucoma vis a vis SAP by mapping the frequency and depth of sensitivity loss at each location in the central 10° around fixation.

Method: Forty eyes with early glaucomatous defect, in form of either nasal step or arcuate scotoma on standard automated perimetry (SAP), and 14 control eyes, underwent microperimetry (MP). Significant loss of retinal sensitivity on microperimetry was mapped for frequency and depth of sensitivity loss at each location in the central 10° around fixation.

Results: Twenty one out of forty eyes had isolated nasal steps and 19 had arcuate defects on SAP examination. The corresponding retinal quadrant/ hemisphere showed significant defects on MP. The average mean sensitivity (MSMP) in the glaucomatous eyes and in the control eyes was 11.8 ± 3.9 dB (6.3-17.4) and 16.6 ± 1.2 dB (15.1-18.9), respectively, $p = 0.0004$. The average mean defect (MDMP) in glaucomatous and control eyes was -6.5 ± 2.0 dB (-12.1 – -2.2) and -3.0 ± 1.2 dB (-4.8 – -0.8) respectively, $p = 0.05$. In case of eyes with nasal step an absolute scotoma was 14-28% of eyes 8 -10° off the fixation while moderate to mild defects were in seen 10-52% of eyes, with at-least 10% of eyes showing involvement as close as 4° from the fixation. Eyes with an arcuate scotoma showed an absolute scotoma on MP1, in 5-95% of eyes, at locations 6-10 degrees from fixation, with extension up to 2 degrees from fixation in 5-21%. The normal hemisphere on SAP in the glaucomatous showed a mild defect 13-43 % of eyes.

Conclusion: The defects on microperimetry appear to be more extensive and closer to the fixation as compared to standard automated perimetry.

P195 STRUCTURE-FUNCTION RELATIONSHIP BETWEEN SCANNING LASER TOMOGRAPHY, FLICKER DEFINED FORM PERIMETRY AND STANDARD AUTOMATED PERIMETRY IN PATIENTS WITH GLAUCOMA

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Purpose: To investigate the correlation between structure and function using scanning laser tomography, flicker defined

form (FDF) perimetry and standard automated perimetry (SAP).

Methods: The sample consisted of 119 participants with early to moderate glaucoma (mean age 63.49 ± 9.22 years, Male/Female ratio = 0.83h). One eye of each participant was randomly assigned if both eyes were eligible for the study (60 OD). The study consisted of 3 visits over a 6 week period and included standard automated perimetry (SAP, 24-2 ASTA-Std; visits 2 and 3) and flicker defined form perimetry (FDF 24-2 ASTAStd; all visits) on the Heidelberg Edge Perimeter (HEP; Heidelberg Engineering (HE)). Scanning laser tomography images of the optic nerve were acquired on the first 2 visits. Unreliable HEP visual fields and poor quality images on the HRT were excluded from the study. The SAP/ FDF visual fields were divided into sectors corresponding to the six HRT Moorfields regression analysis sectors. The relationship between global and sectoral HRT parameters and the mean deviation (MD) of FDF and SAP were analyzed using correlation coefficients and linear regression. Kappa analysis was used to score the agreement between global and sectoral classifications, i.e WNL, BL and ONL.

Results: The mean MD of FDF and SAP were -7.46 ± 5.39 dB and -2.97 ± 2.34 dB. There was significant correlation between the FDF and SAP MD and HRT rim area, cup shape, rim volume, cup to disc ratio and FSM discriminant function measured by the HRT ($p < 0.001$), with FDF always giving higher correlations. For example, the correlation between HRT rim area and FDF/SAP MD were (r-value): Global: 0.45/0.26, sup tmp: 0.44/0.32, tmp: 0.31/0.18, inf tmp: 0.56/0.38, sup nsl: 0.37/0.30, nsl: 0.24/0.05, inf nsl: 0.31/0.19). Kappa analysis showed fair agreement between FDF and HRT classifications. The Kappa score was always less for SAP. For example, sup tmp: $k = 0.28$ (FDF), 0.16 (SAP); inf tmp: $k = 0.33$ (FDF), 0.32 (SAP).

Conclusions: FDF perimetry correlated better with scanning laser tomography than SAP in this sample of patients with early to moderate glaucoma.

P196 HEIDELBERG EDGE PERIMETRY IN GLAUCOMA DIAGNOSIS

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Background: Standard automated perimetry has become the clinical standard for diagnosing and monitoring glaucoma patients. The white-on-white Heidelberg Edge perimetry (HEP; Heidelberg Engineering, Heidelberg, Germany) is a new alternative to test visual field in glaucoma patients. The aim of this study was to evaluate and compare the diagnostic ability of HEP and Humphrey perimetry (HFA) to detect retinal nerve fiber layer (RNFL) defects measured with spectral-domain optical coherence tomography (OCT).

Methods: Sixty normal subjects and 53 age-matched glaucoma patients were prospectively selected. Only one eye per

subject was randomly included in the statistical analysis. All participants underwent a comprehensive ophthalmologic examination, a reliable HEP (24-2 ASTA Standard strategy), a reliable HFA (Zeiss Humphrey Systems, Dublin, Ca; 24-2 SITA Standard strategy), and imaging with the Spectralis OCT (Heidelberg Engineering). Glaucoma patients had intraocular pressure higher than 21 mmHg and an average RNFL thickness significantly thinned beyond the 5% level. Sensitivity-specificity pairs and the areas under the receiver operating characteristic curves (AUCs) were calculated and compared between HEP and HFA visual field indices: mean deviation (MD) and pattern standard deviation (PSD).

Results: Mean age was 56.9 ± 11.1 years and 60.43 ± 8.9 years ($p = 0.068$) and RNFL average thickness was $97.2 \pm 8.4 \mu\text{m}$ and $65.3 \pm 11.0 \mu\text{m}$ ($p < 0.001$) in the normal and glaucoma group, respectively. MD was -0.46 ± 1.1 dB for HFA and -0.31 ± 1.4 dB for HEP in the control group ($p = 0.525$), while MD was -7.90 ± 7.2 dB for HFA and -7.24 ± 6.4 dB for HEP in the glaucoma group ($p = 0.619$). PSD of HFA (0.972) and PSD of HEP (0.951) had the largest AUCs. There was no significant difference between both AUCs ($p = 0.418$). At a fixed specificity of 95%, sensitivity was 91.1% for PSD of HEP (cut-off point: 1.96) and 89.3% for PSD of HFA (cut-off point: 1.92).

Conclusions: HEP and HFA had similar diagnostic ability to discriminate between healthy and glaucoma patients with RNFL defects. PSD yielded the best sensitivity-specificity balance for both systems.

P197 COMPARISON OF SLOPES OF VISUAL FIELD LOSS PROGRESSION BETWEEN PERIDATATM PROGRAM AND GUIDED PROGRESSION ANALYSIS (GPAII) IN GLAUCOMA PATIENTS

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Purpose: To compare the slopes of progression measured by GPAII and PeriData™ in a glaucoma group.

Methods: Retrospective, observational study including 56 eyes of 32 known glaucoma patients with at least 5 reliable visual field examinations in minimum 2 years. Patients who underwent filtering surgery or laser trabeculoplasty during the follow-up period were excluded.

Results: Mean age was 70 ± 18 yrs. Each patient performed a mean number of 13 ± 4.6 (range: 9 to 28) standard automated perimetry visual test (Sita Standard 24-2) per eye and with a mean follow-up of 7.5 ± 1.3 yrs. The mean of progression by PeriData (dB/year) and GPA (%/year) were: -0.2 ± 0.38 and -0.55 ± 0.71 respectively. This difference in progression was significantly different. There was an excellent correlation between Peridata progression analysis and GPA (< 0.001).

Conclusion: Rate of progression with GPA and progression analysis of PeriData are two trend analyses. They represent complementary information and methods for progression of VF. Our data showed a significant difference between the slopes measured by GPAII and PeriData. GPAII showed more negative values which means that it predicts a faster progression.

P198 COLOR AND LUMINANCE VARIANT PUPILLOGRAPHIC PERIMETRY IN GLAUCOMA

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Background: Recent studies utilizing multifocal pupillographic objective perimetry (mfPOP) have reported diagnostic accuracies for glaucoma in the range of those obtained using FDT-Matrix and aHFA perimetry, with average test durations of less than 3 minutes/eye. These studies utilized mfPOP luminance stimuli which likely elicit pupillary contractions mediated by the subcortical pupillary luminance response (PLR). Pupillary responses to color changes between red and green however, appear to be mediated by the cortical pupillary color response (PCR). This study investigated the diagnostic utility of stimuli aimed at eliciting response components from the PLR as well as the PCR, with the aim of sampling responses derived from a more extensive population of retinal ganglion cells.

Methods: Nineteen glaucoma subjects and 24 normal subjects were tested with three 4 minute mfPOP stimulus variants (protocols). The luminance only protocol utilized 67-150 cd/m² yellow stimuli on a 10 cd/m² yellow background, color and luminance protocols utilized 60-150 cd/m² green stimuli on a 10 cd/m² red background. The 33 ms duration stimuli were presented at mean intervals of 4 s. Stimulus luminances were balanced in two of the three protocols, yielding more uniform fields in normal subjects.

Results: The balanced color and luminance protocol produced the largest reductions in pupillary contraction amplitudes and the highest accuracy for glaucoma using amplitudes alone (ROC AUC Severe – $100\% \pm 0.0$ SE, $n = 3$ eyes; Moderate – $88.1\% \pm 6.2$ SE, $n = 10$ eyes; Mild – $83.2\% \pm 6.0$ SE, $n = 22$ eyes). Combined amplitude and latency measures produced slightly better results in the non-balanced color and luminance protocol (ROC AUC Severe: $100\% \pm 0.0$ SE, $n = 3$ eyes; Moderate: $88.8\% \pm 7.4$ SE, $n = 10$ eyes; Mild: $83.7\% \pm 6.7\%$ SE, $n = 22$ eyes). The time-courses of responses were found to be longer or shorter in patients depending on the severity of their mean defect.

Conclusions: Stimuli targeting both cortical PCR and sub-cortical PLR pupillary response components produced higher accuracy than stimuli targeting sub-cortical PLRs alone. Balancing of stimulus luminances resulted in further increases in accuracy.

P199 UNDERSAMPLING AND SAP TEST-RETEST VARIABILITY

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Background: To determine the relative contributions of eye movements and visual field undersampling to test-retest variability (TRV). Undersampling occurs in standard automated perimetry (SAP) if sensitivity varies across a visual field faster than $1/12$ cyc/deg (Nq), a very gentle rate of change of sensitivity across the field. Building on previously published work [doi:10.1167/iavs.1110-6014] comparing real and model visual fields the present study sought to quantify the relative

contributions of eye movements and undersampling to TRV.

Methods: High resolution model visual fields were spatially smoothed in 9 gradations from nil to $< N_q$. For each of the 9 levels of smoothing interdecile ranges (IDR = 10th to 90th percentiles) of box plots of TRV were determined for 10 bands of scotoma depth from -28.5 to -1.5 dB. This was repeated for 600 sampled fields for each smoothness. Sampling included eye movements equal to that of good fixators.

Results: As observed for SAP fields TRV for the unsmoothed fields grew with scD, being larger than smooth fields at the 9 largest scotoma depths (all $p < 0.003$). By comparison fields smoothed enough to remove the effects of undersampling of showed IDRs that did not differ from 2.5 dB (all $p < 0.025$) at all scotoma depths even though eye movements remained at normal levels.

Conclusions: Only about 2.5 dB of the IDR of TRV can be attributed to eye movements, the remainder appears to be due to undersampling of the field which is exacerbated by the small Type III stimulus size. Large, blurry, perimeter stimuli should therefore reduce TRV due to undersampling, in agreement with recent findings on the effects of using larger stimuli by Wall et al. [e.g., Arch Ophthalmol 2010; 128: 570-6.].

P200 SPARK: A RAPID STRATEGY FOR AVERAGED, MORE STABLE ESTIMATES OF VISUAL FIELD THRESHOLD

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Background: The purpose of this work is to design a rapid perimetric strategy to provide averaged results.

Methods: We designed a simulation examination model using the distribution frequency of local deviations or defects, based on a retrospective study of 90,335 examinations performed in a glaucoma department.

Results: Based on retrospective analysis, threshold deviation from normal age-adjusted values of several combinations of six points allowed estimating the real mean deviation (MD) with a correlation coefficient $r = 0.995$ (standard error SE = 0.71 dB). The six local deviations obtained with the first phase of the rapid Spark perimetric strategy in the simulation model, showed high correlation with the original MD ($r = 0.984$), and with the remaining local deviations which had SE close to the mean threshold fluctuation (3.06 dB). In patients with early glaucoma (MD < 6 dB) the SE of the estimated MD was < 0.9 dB and the SE in estimating the local point-to-point deviations was 1.8 dB. Using the SE of the previous estimate as a step, we included three additional phases to obtain three additional results. In phase 4 and for the average and median of the four phases, the SE of MD ranged from 0.4 to 0.5 dB for the whole sample and from 0.3 to 0.4 in early glaucoma. Local deviation SE was close to 2 dB in the whole sample and between 1.2 and 1.5 dB in early glaucoma.

Conclusions: Bearing in mind threshold fluctuation, the strategy allows for several possible outcomes, and provides averaged and theoretically more stable results.

Fig. 1.- Both images show the approximate distribution of the six regions selected by the program, with respect to the '24-2' type Garway-Heath morphological map (left) in which the

external points (blank) were not analyzed, and with respect to our functional map (right). Fig. 2. – Pearson correlation coefficients (r) and standard error (SE), using multiple regression to estimate the value of MD based on deviations from age-adjusted normal threshold values, of points in regions 1, 2, 3, 4, 5 or 6, using the order specified in Fig 1.

P201 WHAT CHANGES ARE REQUIRED TO WHITE-ON-WHITE PERIMETRY TO IMPROVE DETECTION OF PROGRESSION

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Background: Reliably detecting glaucomatous progression using current white-on-white perimetric methods (SAP) often takes upwards of four years of testing. In this study we used computer modeling to quantify the decrease in variability required in current techniques that would lead to detection of progression on average one year earlier than current methods.

Methods: Assuming a true threshold of t , we measured the error in the estimate of t produced by SAP as the standard deviation of a Gaussian about t , $S(t)$. We derived S by fitting a Gaussian to results from repeated applications of the Full Threshold algorithm simulated on 10000 patients with false response rates of 1%, and a psychometric slope as described in Henson et al (IOVS 2000). As part of this study, we validated this model against published test-retest data, confirming that a Gaussian model based on true thresholds can produce the skewed distributions typical in published test-retest data for SAP. We classified progression in two ways: point-wise linear regression (PLR) on individual locations, and linear regression on Mean Defect (MD). Both techniques used criteria that had 95% specificity at all time periods determined by simulation of 1000 subjects stable at 30 dB. Eight types of point-wise progression were simulated for individual locations: all combinations of -1 or -2 dB change per year, 2 or 3 visits per annum, and a beginning threshold of either 20 or 30 dB. Progression of multiple points was also included for whole field analysis with the number of damaged locations increasing from 1 to 10 for different simulation runs. Improved perimetric procedures were simulated by reducing S in steps of 10% from the original.

Results: Table 1 shows the number of years of testing required to achieve 80% sensitivity (at 95% specificity) using PLR on locations beginning at 30 dB. The top row is for current SAP procedures. Table 2 shows the number of years of testing required to achieve 80% sensitivity (at 95% specificity) using linear regression on MD values on whole fields that begin at 30 dB. The columns headed 100% represent current SAP variability, and those headed 60% represent a simulated procedure with 60%* S variability.

Conclusions: If SAP variability is reduced by 20%, to 80%* S , then some progression can be detected earlier using SAP alone, depending on the severity of the progression and frequency of testing. Progression of 1 dB per year can be detected 1 year earlier using a procedure with 40% less variability than current (60%* S). The methods adopted in this paper can be applied to analyse new perimetric techniques prior to lengthy and expensive clinical trials in order to determine their utility for classifying progression.

P202 CONTRAST SENSITIVITY IN MEXICAN GLAUCOMA PATIENTS

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Objective: To evaluate changes of contrast sensitivity (CS) in Mexican patients with glaucoma.

Design: Prospective, cross-sectional case series.

Material and Method: We evaluated 120 eyes of 72 subjects from the Glaucoma Service at the Instituto Fundacion Conde de Valenciana in Mexico City. Subjects with a diagnosis of glaucoma, suspected glaucoma, or ocular hypertension were recruited. Visual acuity was measured using the rear-illuminated Lighthouse Visual Acuity Chart at 2 m. Contrast sensitivity was measured using the Mars Contrast Sensitivity Chart with even luminance across the chart. Visual fields of the patients were measured.

Results: Significant correlation was found between the visual field mean deviations and the contrast sensitivity scores for each group of damage.

Conclusions: Reduced contrast sensitivity is significantly correlated with visual field losses in Mexican patients with glaucoma. The study data support the conclusion that, compared with visual acuity, the disease process preferentially affects contrast sensitivity. Contrast sensitivity was shown to be more related than visual acuity to real-world function in patients with glaucomatous changes, reason why it becomes a measure that we should pay attention to in order to assess information or visual rehabilitation to achieve self-independence in glaucoma patients.

Clinical Examination Methods: Electrophysiology

P203 CLINICAL APPLICATION OF PHOTOPIC NEGATIVE RESPONSE TO THE FLASH ELECTRORETINOGRAM IN PRIMARY OPEN-ANGLE GLAUCOMA

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Backgrounds: Electroretinography (ERG) has been used since the 1940s to evaluate retinal function. This procedure records electrical potentials that originate from cells in the retinal tissue. A typical ERG reveals three individual waves. The a-wave is the first emerging negative potential in the ERG. It originates from and represents the function of the photoreceptor cells. The b-wave is the abrupt positive potential that follows the a-wave, and it indicates the functional activities of Müller cells and bipolar cells. Finally, the photopic negative response (PhNR) is the negative potential that follows the b-wave. The PhNR is an electrical signal that originates in the retinal ganglion cells (RGC) and their axons and may reflect inner retinal function. Previous studies have indicated that the PhNR may be helpful for the detection of early glaucoma. However, there are an insufficient number of clinical studies involving PhNR in China. In this study, we studied the clinical utility of PhNR by comparing the PhNR parameters of normal patients to those with glaucoma.

Methods: 52 normal subjects (52 eyes) and 137 patients with POAG (137 eyes) were included in the study. Flashes were produced by light emitting diodes (LEDs), white stimulus flash on a white background was used. The Humphrey Perimetry C24-2 procedure was used to test the visual field results including Mean Deviation (MD) and Pattern Standard Deviation (PSD). All the patients were divided into three groups according to the visual field results: early stage group, 55 patients (55 eyes); advanced stage group, 40 patients (40 eyes); and late stage group, 42 patients (42 eyes). Spectral domain optical coherence tomography was used to test the mean retinal nerve fiber layer (mRNFL) thickness of POAG.

Results: The amplitudes of a-waves, b-waves, PhNR and the implicit times of PhNR were different among the four groups ($p < 0.05$). The variation degree of a-waves, b-waves amplitudes and the PhNR implicit times was larger. The MD and mRNFL thickness were positively correlated with the amplitudes for the PhNR ($p = 0.000$), the correlation coefficient was 0.59 and 0.45 respectively. The PSD was negatively correlated with the amplitudes for PhNR ($p = 0.000$), the correlation coefficient was -0.37. The area under the ROC curve of the amplitudes of a-waves, b-waves, PhNR was 0.853, 0.830 and 0.918 respectively. Among the three parameters, the diagnostic value of the amplitudes for PhNR is higher. In the case of setting specificity $\geq 95\%$, the sensitivities of the three parameters were 60.4%, 54.2% and 85.4% respectively.

Conclusions: Compared to normal subjects, the PhNR amplitudes were reduced, and the PhNR implicit times were prolonged in the POAG groups. The decreases in PhNR amplitudes were correlated to the severity of POAG. The PhNR amplitudes had higher sensitivity in POAG early diagnosis, which could serve as a useful evaluation index of visual function of POAG.

P204 CORRELATION BETWEEN MULTIFOCAL VEP RESPONSES AND THINNING OF GANGLION CELL COMPLEX AND RETINAL NERVE FIBER LAYER THICKNESS IN GLAUCOMATOUS EYES

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Background: Agreement and correlation between functional and structural defects have been of a particular interest and importance in diagnosing and monitoring glaucomatous optic neuropathy (GON). Multifocal visual evoked potential (mVEP) and spectral-domain optical coherence tomography (SD-OCT) are considered useful for objectively assessing the macular function and the parapapillary or macular structure, respectively. In addition to the parapapillary retinal nerve fiber layer thickness (RNFLT), ganglion cell complex (GCC) has received increasing attention as a structural measure of GON. The purpose of this study was to evaluate the agreement and correlation among visual field, mVEP, and RNFLT and GCC in eyes with GON at early to moderate stage.

Methods: 56 eyes with GON that had a mean deviation better than -15 dB on the Humphrey Field Analyzer (HFA) SITA-standard 30-2 program (30-2) and 52 age-matched control eyes were enrolled. HFA 30-2, 10-2, mVEP, and SD-OCT were conducted. Visual field was defined as abnormal if clusters of 3 points or more with $p < 5\%$, one of which had $p <$

1%, were present either on HFA 30-2 or 10-2. Three-channel mVEP with two vertical and one horizontal channel straddling the fovea was performed using VERIS Science 5.2 as previously reported (Ishikawa et al. Doc Ophthalmol Epub ahead print). Root-mean-square (RMS) amplitude during 45 and 150 ms from each of 60-local responses was divided by the average of the 60 RMS amplitudes during 325 and 430 ms to yield the signal-to-noise ratio (SNR). Based on receiver operating characteristic analyses regarding the proportion of mVEP responses that exceeded a specific SNR criterion, either of two perpendicular channel combinations (one vertical and the other horizontal) that yielded the better area under the curve was determined, from which probability plots were created at the 60 local points. The same cluster definition as in the HFA test was used for the judgment of abnormal. Average RNFLT and GCC were measured using RTVue and were defined as abnormal if their deviation maps were symbolized either by a yellow ($p < 5\%$) or red ($p < 1\%$) code.

Results: Average (\pm SD) abnormal points of total deviation (TD) 10 and the mVEP were 3.0 ± 5.5 and 2.9 ± 5.4 , respectively, in the controls, whereas that was 24.3 ± 14.8 and 11.7 ± 8.6 , respectively, in the GON eyes ($p < 0.0001$, Mann-Whitney U-test). Cohen's κ was 0.681 between the TD 10 and mVEP judgment. The average RNFLT and GCC were 100.92 ± 12.90 and $91.63 \pm 9.66 \mu\text{m}$, respectively, in the controls, whereas those were 80.38 ± 8.44 and $77.31 \pm 7.44 \mu\text{m}$, respectively, in the GON eyes ($p < 0.0001$, unpaired t-test). The κ value was 0.534 and 0.565 between the mVEP and RNFLT judgments and between the mVEP and GCC judgments, respectively. The correlation coefficient was -0.508 between the mVEP abnormal test points and average RNFLT and -0.449 between those and average GCC, respectively ($p < 0.001$), whereas it was 0.604 between those and the TD 10 abnormal test points ($p < 0.001$).

Conclusions: Both two SD-OCT structural measures were fairly correlated with the two functional measures tested.

P205 MULTIFOCAL VEP AND OCT FINDINGS IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Background: To evaluate objectively the anatomical and functional changes of optic nerve in eyes with primary open-angle glaucoma (POAG) by the joint use of optical coherence tomography (OCT) and multifocal visual evoked potentials (mfVEP).

Methods: 29 eyes with open-angle glaucoma and visual field defects were tested. OCT examination was performed with Humphrey model 3000. The VERIS system was used for the recording of mfVEP. The results were compared with those of 14 eyes of 7 age-matched control normal subjects.

Results: In glaucomatous eyes the mean retinal response density (RRD) was lower than normal in ring 1, 2 and 3 of mfVEP. Specifically the mean amplitude of mfVEP in POAG eyes was estimated at $34.17 \pm 17.62 \text{ nV/deg}^2$, $6.86 \pm 4.82 \text{ nV/deg}^2$ and $2.62 \pm 1.61 \text{ nV/deg}^2$ in rings 1, 2 and 3 respectively. In contrast the mean latency was similar to the normal control eyes. Also, the mean RNFL thickness in POAG eyes was estimated at $76.83 \pm 26.63 \mu\text{m}$ in the superior area, $52.14 \pm 16.25 \mu\text{m}$ in the temporal area, $75.93 \pm 32.49 \mu\text{m}$ in the inferior area and $58.62 \pm 19.39 \mu\text{m}$ in the nasal area. This means

that the RNFL thickness was lower than normal in all the peripapillary areas. Nevertheless the decrease was higher but not statistically significant in the inferior and superior area.

Conclusion: Our study shows that although standard automatic perimetry (SAP) is the gold standard to evaluate glaucomatous neuropathy, the joint use of mfVEP and OCT could be useful in better monitoring glaucoma progression.

Clinical Examination Methods: Photography

P206 AN ODE TO THE OPTIC DISC. A PHOTODOCUMENTATION STUDY

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Background: Glaucoma diagnosis centres on the evaluation of the optic disc. The morphological changes in the intrapapillary and parapapillary region and the retinal nerve fibre layer are the focus of attention of the clinical examination and the different newer modalities like HRT, GDx and OCT. Variations in optic nerve head often put clinicians under dilemma whether the changes are glaucomatous or not. The diagnostic modalities too can support diagnosis in discs which have almost normal size and shape characteristics. 'But what if the optic disc does not follow the rules and tells its own story...'. The aim of this poster is to highlight different type of non glaucomatous entities with discs mimicking glaucomatous disease

Materials and Methods: 423 patients were included in this photodocumentation study. Subjects included were either through direct office visits or referrals as glaucoma suspects. A careful assessment of optic nerve head, disc margin, and cup: disc ratio and neuro-retinal rim was done by slit lamp biomicroscopy and fundus photographs. Diagnosis of glaucoma was established by disc appearance and corresponding visual field changes.

Results: Of the patients referred as glaucoma-suspects, 64% had true glaucomatous optic neuropathy, 8% were suspects with high IOP which on repeat or correlation with CCT were found to be within normal limits. 9% were disc suspects with large sized disc and corresponding large cup, on careful evaluation the NRR was healthy. 12% were high-myopes. There were 12 discs which were tort, 7 were tilted, 3 had situs inversus, 6 had associated medullated nerve fibers, 2 had morning glory syndrome, one with optic disc coloboma and one was macrodisc with disc pit.

Conclusion: Careful evaluation of the optic disc clinically can help differentiate glaucomatous from nonglaucomatous optic nerve head.

P207 RELATIONSHIP BETWEEN CCT AND BETA-ZONE PPA IN GLAUCOMA PATIENTS AND SUSPECTS

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Background: To determine whether there is a relationship between CCT and Beta-zone PPA.

Methods: Retrospective records review. We selected 40 patients from the clinical files of UAB Eye Care who had photographic evidence of Beta-zone PPA. Included were glaucoma patients and suspects. Excluded were eyes with other causes of PPA such as congenital/structural, refractive and inflammatory. The extent of Beta-zone PPA was assigned based on quadrantal presentation: Inferior temporal (IT), superior temporal (ST), both inferior and superior temporal (IT and ST) and 360 degrees. We then compared the ultrasonically measured CCT in these patients with the extent of Beta-zone PPA. There were 74 eyes with complete data.

Results: The mean age of subjects was 64 years ($\pm 13.88/38-90$). Of the 74 eyes analyzed, 30 eyes had IT only (Group A), 8 eyes had ST only (Group B), 30 eyes had IT and ST (Group C) and 6 eyes had 360-degree presentation (Group D). The mean CCT was 547 microns ($\pm 44/462-642$) and 531 (± 50) for right and left eyes, respectively. The median CCT was 551 and 542 for right and left eyes, respectively. The distribution of CCT (SD / range, microns) among the 4 groups was: Group A 546 ($\pm 42/467-623$) microns, Group B 565 (± 42 , 533-624) microns, Group C 552 (± 46 , 462-642) microns and Group D 506 (± 35 , 467-540) microns. Additional analyses were not carried out due to the small numbers in Groups B and D. The thinnest mean CCT value, however, was associated with Group D, those with 360-degree PPA.

Conclusions: From these data, it appears that among glaucoma patients and suspects a thinner CCT corresponds with circumferential Beta-zone PPA but not quadrantal presentation. Measurement of CCT may represent a surrogate for susceptible lamina cribrosa and choriocapillaris damage that manifests as PPA. The results of this pilot project suggest the need for further study using larger numbers and statistical analyses to determine whether a quantitative relationship between the easily clinically measured CCT and PPA in glaucoma patients exists.

P208 STEREOSCOPIC OPTIC NERVE EVALUATION. A NEW TECHNIQUE FOR DETECTING CHANGE

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Background: Optic nerve head (ONH) evaluation remains a central procedure in the diagnosis and management of glaucoma. Stereoscopic examination is the "gold-standard" method of ONH evaluation, whether it be directly with the biomicroscope and auxiliary contact or non-contact lens, or with stereoscopic fundus images which are viewed either by cross-fusion or with the aid of a viewer. Fundus images allow longitudinal comparison. *Longitudinal* stereoscopic comparisons are generally made with two or more stereo pairs presented simultaneously. Rapid comparison of longitudinal images requires the practitioner to alternate viewing between the two pairs, calling on complex extra-ocular muscle movements (cross-fusion, then a saccade while maintaining cross-fusion or a saccade followed by the re-establishment of cross-fusion). Both current stereoscopic evaluation techniques have significant limitations in clinical training settings because only a single observer may view the 3D ONH stereo images at one time. This poster describes the application of relatively new technology allowing group observation of stereoscopic ONH images. It can be used in evaluating either independent or serial stereo images. The technique is par-

ticularly useful in training clinicians because multiple observers can view the stereoscopic ONH images simultaneously. The technique offers improved management of glaucoma patients allowing more rapid detection of structural changes with greater accuracy.

Methods: Digital ONH optic nerve images were acquired by a VISUCAM PRO NM (Carl Zeiss Meditec) and exported to a removable USB storage device. A GT 240 GALAXY GeForce 200 series graphics card (NVIDIA) was used to produce the 3D signal operating by a computer (DELL VOSTRO 200 E7200 at 2.53 GHz with 1.00 GB RAM) running Windows 7 Professional 32-bit Operating System (Microsoft Corporation) and equipped with 512 MB RAM. The 3D image was presented on a 22 inch (56 cm) full HD 1080 line 120 Hz LCD monitor (ASUS model VG236 LCD Monitor). The 3D images were viewed through active shutter glasses (NVIDIA Part Number 942-10701-0003-001) synchronized with a USB controller/IR emitter (NVIDIA).

Results: This technique allows single and multiple longitudinal stereo (3D) ONH images to be viewed simultaneously by multiple observers without cross fusion or expensive custom viewing stations.

Conclusions: This poster describes a new technique for viewing stereo (3D) ONH images. Although custom viewing systems have allowed multiple observers to view stereoscopic images simultaneously. It employs a low cost commercial 3D video processor and monitor. Unlike the common technique of viewing stereo ONH images by cross fusion, this simple technique allows multiple observers to evaluate 3D ONH images simultaneously. It also should improve concordance between experienced clinicians and training novice clinicians.

Clinical Examination Methods: Imaging of the Anterior Segment

P209 UBM VERSUS ANTERIOR SEGMENT OCT FOR NARROW ANGLE MEASUREMENT

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Introduction: To evaluate and compare angle opening in case of narrow angle using UBM (VisumaxII, Sonomed) and anterior segment OCT (Visante-OCT, Zeiss).

Methods: One hundred eyes of 50 consecutive patients, with gonioscopic narrow angle, were referred in Explore Vision Center for angle imaging. All patients underwent AS-OCT and UBM (35 MHz) on four meridians (3, 6, 9 12 o'clock meridians) in both eyes, in dark condition. UBM and OCT scans have been performed perpendicularly to the limbus. Angle opening distance at 500 μ m and 750 μ m from the scleral spur (AOD 500 and AOD750) were measured and compared.

Results: Angle opening measurement was smaller on superior meridians with both devices. Angle opening measured by anterior segment-OCT were significantly larger (~30%) for both AOD500 and 750 than UBM in each meridians.

Discussion: Gonioscopy remains the reference standard for narrow angle diagnosis. Angle imaging by UBM (Fig. 1) and anterior segment OCT gives objective quantitative measurements. This study shows a significantly larger angle opening

measured by anterior segment-OCT versus UBM. This result can be correlated to moderate infrared illumination of fundus by Visante-OCT despite dark condition in the room. On the other hand UBM can be performed in real dark condition. Furthermore, anterior segment reconstruction can be quite different in both techniques: OCT needs a corneal curvature reference that can be distorted by using scans perpendicular to limbus.

P210 LENS VAULT, THICKNESS, AND POSITION IN JAPANESE SUBJECTS WITH ANGLE CLOSURE

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Background: Primary angle-closure glaucoma is a leading cause of blindness, particularly in Asian countries. The ocular risk factors for developing angle-closure glaucoma are shallow anterior chamber, shorter axial length, and increased lens thickness. However, there is little literature investigating the distributions using anterior segment optical coherence tomography (AS-OCT) between primary angle closure suspect (PACS) and primary angle closure (PAC), primary angle-closure glaucoma (PACG) in Japanese. The purpose of this study was to investigate the association of lens parameters with angle closure in Japanese and assess the variations of these parameters between PACS and PAC/G using AS-OCT.

Methods: This is the prospective and comparative study. One hundred eighty three of 125 patients with angle closure which were not performed laser peripheral iridotomy [consisting 98 eyes of PACS, 85 eyes of PAC/G and 69 eyes of 55 normal subjects with open angle were recruited. All participants underwent A-scan biometry and AS-OCT. Lens thickness (LT), anterior chamber depth (ACD), lens vault (LV), lens position (defined as $ACD + 1/2LT$) and relative LP (defined as $LP/axial\ length\ [AL]$) were measured and calculated.

Results: Significant differences between angle-closure and normal eyes were found for LV ($986 \pm 216\ \mu m$ vs. 491 ± 237 ; $p=0.000$), LT ($5.07 \pm 0.37\ m$ vs. 4.59 ± 0.46 ; $p=0.000$), LP ($5.08 \pm 0.23\ m$ vs. 5.42 ± 0.33 ; $p=0.000$), and RLP (0.226 ± 0.011 vs. 0.233 ± 0.014 ; $p=0.000$), respectively. After adjusting for age, gender, ACD, LT, and RLP, increased LV and LT was associated significantly with angle-closure (odds ratio [OR], 35.1; 95% confidence interval [CI], 6.34-194.54, comparing lowest to highest quartile, and OR, 17.92; 95% CI, 2.02-158.93, respectively, but no association was found LP (OR, 4.61; 95% CI, 0.64-32.99) and RLP (OR, 1.86; 95% CI, 0.54-6.43). However, no significant differences between PACS and PAC/G were found for LV ($999 \pm 222\ \mu m$ vs. 978 ± 208 , $p=0.51$), LT ($5.10 \pm 0.33\ m$ vs. 5.02 ± 0.42 ; $p=0.17$), LP ($5.06 \pm 0.020\ m$ vs. 5.09 ± 0.26 ; $p=0.30$), and RLP (0.225 ± 0.011 vs. 0.227 ± 0.011 ; $p=0.20$).

Conclusion: Eyes with angle closure have thicker lens with greater LV compared with normal eyes in Japanese. The LV, which represents the anterior portion of the lens, is a novel parameter independently associated with angle closure after adjusting for age, gender, ACD, and LT. However, these parameters cannot be used to differentiate PACS from PAC/G in the Japanese.

P211 THE CHANGE OF ANTERIOR CHAMBER ANGLE MEASURED WITH ANTERIOR SEGMENT OCT AFTER ICL IMPLANTATION

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Purpose: To compare the change of anterior chamber angle using anterior segment OCT (AS-OCT) before and after ICL implantation in high myopia.

Design: Prospective, comparative, interventional, clinical trial.

Methods: Total of 40 eyes of 20 patients who underwent ICL implantation were enrolled in the study. Several anterior chamber parameters were measured pre and postoperatively using anterior OCT.

Main outcome measure: The angle-opening distance (AOD500, AOD750), the trabecular-iris space area (TISA500, TISA750), and scleral spur angle at the nasal and temporal angles were measured with AS-OCT.

Results: There were statistically significant decreases in AOD 500, AOD 750, TISA 500, TISA 750, and scleral spur angle after ICL implantation ($p < 0.001$).

Conclusions: The anterior chamber angle was significantly narrowed after ICL implantation which confirmed by parameters of AS-OCT. We should concern developing PAS or increasing IOP after ICL implantation.

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P212 ANGLE ASSESSMENT COMPARING TWO SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY DEVICES AND GONIOSCOPY

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Aim: To compare the ability of two high resolution, spectral domain optical coherence tomography (SD-OCT) devices to identify angle structures and angle closure, using gonioscopy as the reference standard.

Methods: This was a prospective, non-randomized comparative study. Consecutive patients attending the glaucoma clinics at the Singapore National Eye Centre underwent dark-room non-indentational gonioscopy, followed by 4-quadrant anterior segment imaging using iVue (Optovue Corporation, California) and Cirrus (Carl Zeiss Meditec, California) SD-OCT devices by an independent masked examiner. OCT images from both machines were evaluated by another independent masked examiner for the ability to discern Schwalbe's line (SL), trabecular meshwork (TM), Schlemm's canal

(SC), scleral spur (SS), and if angle closure was present. Angle closure in each quadrant was defined as the presence of contact of the iris with the angle wall anterior to the SS on OCT imaging. For gonioscopy, angle closure was defined if the posterior trabecular meshwork was not visible in that quadrant. Angle closure in an eye was defined as angle closure in 2 or more quadrants on OCT or gonioscopy. The identification of SL, TM, SC, SS and angle closure were compared between iVue and Cirrus OCT machines, and angle closure status compared between each of the machines and gonioscopy using AC1 statistics.

Results: 69 eyes of 69 patients (46.4% male, 84.1% Chinese, mean age 64.0 ± 10.5) were included. 58.0% had closed angles on gonioscopy. The most identifiable structures on Cirrus was SS (82.2% of images) and SL (77.2%), while that on iVue were SL (74.5%) and TM (68.2%). SC was the least frequently identified structure in both Cirrus and iVue (10.1% and 13.5% respectively). Angle status was unable to be determined in 14.5% of eyes on Cirrus and 50.7% of eyes on iVue ($p < 0.001$) mainly due to poor image quality. While there was substantial correlation between Cirrus and iVue for angle closure (19.1% and 17.0% of eyes were closed on Cirrus and iVue respectively, $AC1 = 0.67$), correlation of angle status of eyes of both machines with gonioscopy was fair to moderate ($AC1 = 0.35$ and 0.50 for Cirrus and iVue, respectively, when compared to gonioscopy).

Conclusions: It was more difficult to determine angle closure status with the iVue SD-OCT compared to Cirrus SD-OCT. Correlation of both machines with gonioscopy was only fair to moderate.

P213 DYNAMIC INTRAOPERATIVE IMAGING OF THE ANTERIOR EYE-SEGMENT BY OCT DURING TRABECULECTOMY

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Background: By connecting the high resolution OCT Visante with the surgical microscope OPMI Visu 200 with a glass fiber the anterior segments of the eye can be shown during intraoperative procedures.

Methods: Case studies of intraoperative dynamic imaging of the anterior segment during trabeculectomy.

Results: Presentation of video recordings of intraoperative dynamic changes of the anterior eye-segment during trabeculectomy.

Conclusion: By connecting a surgical microscope with a high resolution OCT by a glass fiber intraoperative dynamic changes of the anterior eye-segment during trabeculectomy can be shown.

P214 CENTRAL CORNEAL THICKNESS: COMPARATIVE STUDY BETWEEN MEASUREMENTS OBTAINED WITH ULTRASOUND PACHYMETRY AND PENTACAM HR

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Background: Central Corneal Thickness (CCT) has been shown to influence intra-ocular pressure (IOP) measurements with Goldman applanation tonometry and to be an

independent risk factor for the development of primary open-angle glaucoma. The most commonly used technique for measuring corneal thickness is ultrasound pachymetry (UP). However, there are other methods that allow its determination. The Pentacam, which uses a rotating Scheimpflug camera to image the anterior segment of the eye, offers a non-contact way of assessing CCT. This study was performed to compare CCT measurements obtained using the Pentacam HR and ultrasound pachymetry.

Methods: In a prospective study, 3 CCT measurements were taken with the Pentacam HR (Oculus, Inc.) and UP (Humphrey 850) in that sequence from one eye of 33 consecutive patients with normal corneas. The 3 measurements taken with each instrument were averaged and treated as a single number. Paired *t* test was carried out to assess whether there were any differences between the measurements taken with the 2 instruments.

Results: The mean \pm standard deviation of the corneal thickness was $528 \pm 39 \mu\text{m}$ for UP and $544 \pm 39 \mu\text{m}$ for Pentacam. The mean difference between measurements was $16 \mu\text{m}$, with a 95% confidence interval ranging from 9 to $22 \mu\text{m}$. There was a high correlation between the CCT readings by the 2 methods (correlation coefficient: 0.89). A paired *t* test showed that the difference between the data sets was statistically significant ($p < 0.001$), with the Pentacam giving higher readings for CCT compared with the UP.

Conclusions: Our study showed that the CCT measurements obtained by Pentacam HR and UP were well correlated. However, there is a statistically significant difference between the readings with the 2 instruments. Measurements obtained with the Pentacam were systematically higher than those provided by the UP. Therefore, the measurements obtained with the 2 instruments are not interchangeable. Our results are similar to those reported by some authors. The Pentacam also provides additional information about the anterior chamber of the eye, such as corneal topography and curvature, anterior chamber angle, volume and depth. In our opinion these characteristics make this instrument rather promising.

P215 DETERMINANTS AND PREDICTION MODELS OF ANGLE WIDTH FROM ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IMAGES

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Background: To investigate the determinants of angle width; and to derive mathematical models to predict angle width, as measured using anterior segment optical coherence tomography (ASOCT).

Methods: Subjects were recruited from an on-going population based cross-sectional study of Chinese persons aged 40 years and older in Singapore. Participants underwent gonioscopy, A-scan biometry, and imaging by ASOCT (Carl Zeiss Meditec, Dublin, CA). Customized software (Zhong-

shan Angle Assessment Program, Guangzhou, China) was used to measure the ASOCT parameters and data only from right eye was used for analysis. Linear regression modeling using the R-square, best subsets selection method was performed with trabecular-iris space area at 750 μm (TISA750) and angle opening distance at 750 μm (AOD750) as the dependent angle width variables. Using a combination of ASOCT and A-scan variables, an optimal model that was predictive of angle width was determined by a forward selection regression algorithm.

Results: Complete data were available for 1067 subjects. The mean (standard deviation) age was 56.9 (8.5) years and 50.2% were male. For TISA750, the best determinants among the ASOCT and A-scan independent variables were anterior chamber volume (ACV, $r^2 = 0.51$), followed by anterior chamber area (ACA, $r^2 = 0.49$) and lens vault (LV, $r^2 = 0.47$). The best determinants of AOD750 were LV ($r^2 = 0.56$), followed by ACA ($r^2 = 0.55$) and ACV ($r^2 = 0.54$). The R^2 value for anterior chamber depth (ACD) and axial length (AL) were 0.39 and 0.27 respectively for TISA750, and 0.46 and 0.30 respectively for AOD750. Results were largely similar when the analyses were performed separately in males and females. An optimal model consisting of 6 variables (ACV, ACA, LV, anterior chamber width, iris thickness at 750 μm , and iris area) explained 81.4% of the variability in TISA750 and 85.5% of the variability in AOD750. The addition of more parameters did not improve the r-square value.

Conclusions: ACA, ACV and LV were the most important determinants of angle width. A predictive model comprising 6 quantitative ASOCT parameters explained more than 80% of the variability of angle width, and may therefore be useful in screening for angle closure.

P216 EVALUATION OF PERIPHERAL ANTERIOR CHAMBER DEPTH OF FELLOW EYES OF ACUTE ANGLE CLOSURE BY SCANNING PERIPHERAL ANTERIOR CHAMBER DEPTH ANALYZER

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Background: We evaluated the grade of peripheral anterior chamber depth (PACD) by scanning peripheral anterior chamber depth analyzer (SPAC) for the fellow eyes of patients who had acute angle closure. Furthermore, SPAC measurements were compared with those of other ocular biometric instruments.

Methods: Twenty-eight consecutive patients (20 female, 8 male, mean ages of 68.6 ± 9.9 years old) who had acute angle closure were examined. Eyes that had been performed prophylactic laser peripheral iridotomy and those treated with pilocarpine were excluded. Ocular biometry by SPAC, A-scan ultrasonography, ultrasound biomicroscopy (UBM) was performed for the un-affected eyes. SPAC measurements were graded into 1 (closed) to 12 (wide open) automatically. UBM images were analyzed using the parameters of AOD500 and TIA.

Results: Eighteen eyes with unilateral APAC were enrolled in the study. Average central anterior chamber depth (CADC) and axial length measured by A-scan was 2.61 ± 0.43 and 22.38 ± 0.87 mm, respectively. SPAC measurement of average CADC was 2.46 ± 0.42 mm and average PACD grade

was 4.7 ± 1.2 , respectively. SPAC categorical grading of P or S (both symbols were prone to angle closure) was 61.1% (11 subjects). When compared SPAC categorical group S, P and non S, P, significantly shallow anterior chamber depth by SPAC and smaller SPAC grading were demonstrated. All UBM parameters did not show significant difference between S, P group and non S,P group. SPAC grading correlated well with CADC by IOL master and SPAC, but not with UBM parameters.

Conclusion: The fellow eye of acute angle closure was reported to be high risk eye for future angle-closure glaucoma. In this study, although the number of patients was small, the relative weak performance to detect anatomic findings of such pre-stage angle closure eyes by SPAC might have some limitations for its daily clinical practice and mass screening.

P217 WAY TO INCREASE THE EFFICIENCY OF PERIPHERAL LASER IRIDECTOMY IN PRIMARY ANGLE-CLOSURE GLAUCOMA PATIENTS

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Background: An increase in the intraocular pressure in PACG patients is connected with pathological anatomical features of the anterior segment of the eye. Peripheral laser iridectomy (PLI) is an effective procedure in case of the presence functional pupillary block and closing o the anterior chamber angle (ACA) due to the iris curvature (IC). However, this laser operation is ineffective in case of plateau iris syndrome when ACA is blocked by the iris root.

Methods: We have analyzed anterior segment tomograms of 24 patients (48 eyes) with PACG before and after laser iridectomy. The age of patients varied from 53 to 81 years (average 69.2 ± 8.0) ($M \pm \sigma$). 27 persons (54 eyes) at the age from 55 till 80 years formed the control group. The tomography of anterior segment was received in a horizontal meridian (0-180°) at level and longitudinally an anatomic axis. On the received tomograms in temporal and nasal segments were measured: ACA (ACA T, ACA N), stroma's thickness of the iris in 500 microns distance from scleral spur (IT T, IT N), iris curvature at the level of half of its length (IC T, IC N). The purpose of investigation was to determine the dependence of efficiency of laser iridectomy from index size: $iPLI = (IC T + IC N) / (IT T + IT N)$.

Results: Average ACA values in the control group were 32.3 ± 12.7 and 32.9 ± 12.2 degrees in temporal and nasal segments, accordingly ($M \pm \sigma$). Average value iPLI in control group was (0.57; 0.40; 0.76) [Me; 25%; 75%]. Average ACA values before and after PLI differed significantly ($p < 0.01$) and were: 9.6 ± 7.4 and 20.1 ± 9.8 in temporal both 11.9 ± 6.9 and 21.3 ± 8.4 degrees in nasal segments. ACA has summary increased in two segment (EffPLI) on 20.1 ± 14.2 degrees after PLI. All the patients have been divided on two groups depending on EffPLI: PLI1 (EffPLI < 20.1) ($n = 25$) and PLI2 (EffPLI > 20.1) ($n = 23$). ACA in temporal and nasal segments significantly did not differ significantly in PLI1 (11.6 ± 7.0 and 12.3 ± 7.4) and PLI2 groups (7.6 ± 7.4 and 11.5 ± 6.4). Average values iPLI for groups PLI1 and PLI2 were (0.89; 0.76; 1.08) and (1.56; 1.02; 2.32) [Me; 25%; 75%], accordingly. Using these data, we have assumed, that criteria EffPLI < 20.1 is iPLI < 0.89. The part of patients with

EffPLI > 20.1 in group with iPLI < 0.89 was 20.0% and differed significantly ($\chi^2 < 0.05$) from the group with iPLI ≥ 0.89 where the part of patients with EffPLI > 20.1 was 60.6 %.

Conclusion: Thus using criterion iPLI ≥ 0.89 efficiency PLI can be increased on the average by 40.6% [CI, 13.8%; 67.4%].

P218 CORRELATION OF RETINAL NERVE FIBER LAYER THICKNESS ON OCT AND VISUAL FIELD INDICES IN GLAUCOMA PATIENTS AND NORMAL SUBJECTS

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Background: To compare retinal nerve fiber layer thickness and visual field indices in glaucoma patients and normal subjects.

Methods: Prospective, non randomized, cross sectional study of 224 eyes of 125 patients. Five groups including glaucoma suspects (GS), Primary open-angle glaucoma (POAG), Ocular hypertensives (OHT), Normal-tension glaucoma (NTG) and normal subjects underwent white on white perimetry at baseline, 1 month and 3 months of first visit, and Stratus OCT Scan at first visit and 3 months. Visual field global indices were compared with OCT retinal nerve fiber layer (RNFL) analysis parameters. RNFL thickness at baseline was compared with thickness at 2nd visit.

Results: OCT parameters did not correlate with VF indices in glaucoma suspects and normal patients, while correlation was statistically highly significant in POAG and significant in OHT and NTG patients.

Conclusion: OCT is an effective tool in monitoring disease progression by measuring RNFL loss in patients of POAG, ocular hypertensives and NTG.

P219 IMAGING OF ANTERIOR CHAMBER ANGLE BY SWEEP-SOURCE AND TIME-DOMAIN ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IN EYES WITH NARROW ANGLE

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Background: To evaluate the usefulness of Sweep-source (SS) anterior segment optical coherence tomography (AS-OCT) in scleral spur detection and anterior chamber angle measurements in comparison with time-domain (TD) AS-OCT in eyes with narrow angle.

Methods: Forty two eyes of 22 patients (2 men, 20 women) with narrow angle were enrolled. Of the 42 eyes, 18 eyes were classified as primary angle closure suspect, 15 eyes were classified as primary angle closure, and 9 eyes were classified as primary angle-closure glaucoma. All participants underwent gonioscopy, SS-OCT (SS-1000, Tomey, Nagoya, Japan), and TD-OCT (Visante; Carl Zeiss Meditec, Dublin, California). A narrow angle was defined as an angle in which > 270° of the posterior trabecular meshwork cannot be seen. SS-OCT images were obtained in dark conditions using the anterior segment mode, and TD-OCT images were obtained in dark conditions using enhanced anterior single mode. Scleral spur location was assessed in AS-OCT images by

masked examiner and was defined as the point where there was an inward protrusion of the sclera with a change in curvature of its inner surface. Angle opening distance (AOD) and the trabecular-iris space area (TISA) were measured semi-automatically from OCT images.

Results: The scleral spur was detectable with TD-OCT in 19 images (23%) in nasal/temporal images while the scleral spur was detectable with SS-OCT in 51 images (61%). The difference was statistically significant ($p < 0.001$, Fisher exact test). The average AOD and TISA measured by TD-OCT and SS-OCT in 14 images in which scleral spur was detectable with both OCTs, the mean anterior chamber angles measured by TD-OCT and SS-OCT were 0.212/0.202 mm (AOD500, $p = 0.77$, paired t-test) and 0.077/0.050 mm² (TISA500, $p < 0.01$, paired t-test), respectively.

Conclusions: SS-OCT was superior to TD-OCT in detecting scleral spur in patients with narrow angles. TISA500 measurement value was lower in SS-OCT analysis.

P220 ANTERIOR SEGMENT BIOMETRY IN EYES WITH NARROW ANGLE USING PENTACAM ROTATING SCHEIMPLUG IMAGING

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Background: To compare anterior segment parameters in normal open angle eyes and eyes with narrow angle using Pentacam rotating Scheimpflug imaging.

Methods: 46 eyes from 46 consecutive patients with narrow angle were enrolled. Age- and gender-matched 20 eyes from 20 participants with normal open angle formed the control group. A narrow angle was defined as an angle in which > 270° of the posterior trabecular meshwork cannot be seen. When both eyes of the same subject were eligible, right eye was selected. Of the 46 patients with narrow angle, 20 eyes were classified as primary angle closure suspect, 20 eyes were classified as primary angle closure, and 6 eyes were classified as primary angle-closure glaucoma. Anterior chamber volume (ACV), central anterior chamber depth (CACD), anterior chamber angle (ACA), corneal volume (CV), central corneal thickness (CCT), mean corneal radius of the front (front Rm) and back (back Rm) surface, corneal shape factor (Q) were measured with Pentacam.

Results: The average ACV, CACD, ACA, CV, CCT, front Rm, back Rm, and Q in narrow angle and open angle were 65.7/132.7 mm³ ($p < 0.0001$, t-test), 1.80/2.72 mm ($p < 0.0001$), 21.7/32.3° ($p < 0.0001$), 60.6/60.7 mm³ ($p = 0.9104$), 536.5/552.1 mm ($p = 0.4093$), 7.59/7.67 mm ($p = 0.2499$), 6.17/6.24 mm ($p = 0.3465$), and -0.51/-0.51 ($p = 0.9856$), respectively.

Conclusions: Eyes with narrow angle tend to have smaller anterior chamber depth, volume, and angle than those of eyes with open angle. However, there was no significant difference in corneal parameters between both groups. The rotating Scheimpflug imaging is an effective method for screening eyes with narrow angle.

P221 LONGITUDINAL CHANGE IN ANTERIOR CHAMBER DEPTH OF EYES WITH ANGLE CLOSURE AFTER LASER IRIDOTOMY

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Purpose: To investigate longitudinal changes in anterior chamber depth (ACD) of eyes with angle closure after laser iridotomy (LI) and factors related to prognosis.

Patients and Methods: Eyes with primary angle closure (PAC), acute PAC, or chronic angle-closure glaucoma (CACG) that underwent LI during the period of November 2004 to December 2007 were enrolled (LI group). Eyes that underwent phaco-emulsification and intra-ocular lens insertion in the same period were employed as controls (PEA+IOL group). Longitudinal changes in ACD were evaluated with a scanning peripheral anterior chamber depth analyzer (SPAC) in addition to routine ophthalmic examination after LI or PEA+IOL.

Results: The numbers of eyes of LI group and PEA+IOL group were 48 eyes of 48 subjects (69.8 ± 8.5 years) and 21 eyes of 21 subjects (65.6 ± 12.7 years), respectively. Mean follow-up times of LI group and PEA+IOL group were 43.4 ± 12.7 months and 36.5 ± 2.5 months, respectively. LI significantly increased ACD as indicated by the SPAC grade change from 3.8 ± 1.1 to 4.6 ± 1.2 ($p = 0.0002$). LI deepened the peripheral ACD but not the central ACD. SPAC grade was gradually reduced during the follow-up period and reached the baseline by the third year of follow up. PEA+IOL significantly increased SPAC grade from 6.7 ± 1.6 to 8.7 ± 2.0 ($p < 0.001$) but no time-related change was observed. Eyes with PAC and CACG showed similar profiles of LI-induced changes, but eyes with acute PAC showed a smaller change than eyes with PAC and CACG. Twenty-three cases presented with deterioration during the follow-up period. The type of glaucoma, the intra-ocular pressure before LI, the presence of plateau iris configuration, the number of anti-glaucoma eye drops used, and the degree of glaucomatous visual field defects were associated with prognosis.

Conclusions: ACD is temporarily deepened by LI and tended to return to the baseline after some time. Profiles of LI-induced changes differed among the type of angle closure. The type of angle closure and certain factors influenced the prognosis.

P222 IMAGING OF TRABECULECTOMY BLEBS WITH VISANTE ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY AFTER DIGITAL OCULAR COMPRESSION

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Purpose: To investigate change of intra-bleb morphology of functioning trabeculectomy blebs with anterior segment optical coherence tomography (AS-OCT) after digital ocular compression.

Design: Prospective cross-sectional study.

Methods: Sixty eight patients who had fornix-based trabeculectomy were recruited from Seoul St. Mary's hospital. Intraocular pressure (IOP) and AS-OCT images were taken before and after ocular compression. By AS-OCT, bleb

height, bleb wall thickness, height and length of the internal cavity were measured. The hyporeflective area and number of microcysts were checked on both vertical and horizontal images. The AS-OCT parameters were compared by IOP change, bleb morphology, and interval between surgery and examination.

Results: Significant changes of AS-OCT parameters were observed by ocular compression, except maximum bleb wall thickness. The correlation between IOP change and the parameters of AS-OCT was greatest with the horizontal and vertical length of the internal cavity (Spearman correlation coefficient $r = 0.717$; $p < 0.0001$ and $r = 0.866$; $p < 0.0001$, respectively). The response to ocular compression in cystic blebs were mainly by enlargement of the internal cavity and increase in bleb height. However, in diffuse filtering blebs, increase in hyporeflective area and number of microcysts were the main findings. After 6-12 months of surgery, the change in the intra-bleb parameters of AS-OCT significantly reduced, showing no difference after ocular compression.

Conclusions: The change of internal bleb morphology after digital ocular compression were significant with AS-OCT in blebs less than 6 months post-operatively. And the response to ocular compression was different by bleb morphology.

P223 LENS VAULT IN ASIAN INDIAN EYES WITH ANGLE CLOSURE

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Background: To measure lens vault (LV) in Asian Indian eyes with angle closure.

Methods: In this prospective observational comparative study, subjects with primary angle closure (including angle closure suspects (PACS), angle closure (PAC) and angle closure glaucoma (PACG)) and normals were enrolled. All subjects underwent gonioscopy and imaging with Fourier-domain source-swept anterior-segment optical coherence tomography (SSOCT; Tomey, Japan). LV was defined as the perpendicular distance between the anterior pole of the crystalline lens and the horizontal line joining the 2 scleral spurs (SS). It was measured manually, after marking the SS, in both horizontal and vertical scans. Imaging was performed prior to laser iridotomy.

Results: Ninety-five eyes (62 subjects) with gradable images (determined by scleral spur detection) were analyzed; 51 eyes (39 subjects) had angle closure and 44 eyes (23 normal subjects) had open angles. LV was found to be significantly greater in angle closure eyes compared to normal eyes for both horizontal (782.1μ , 95% C.I. 726.4 - 837.8 , vs. 526.9μ , 95% C.I. 486.2 - 567.6) ($p < 0.0001$) and vertical (825.9μ , 95% C.I. 780.2 - 871.6 vs. 589.3μ , 95% C.I. 538.2 - 640.4) ($p < 0.0001$) scans. There were no significant differences between PACS (11 eyes), PAC (18 eyes) and PACG (22 eyes) ($p > 0.05$) for scans from either meridian. After adjusting for age and gender, higher vertical LV (odds ratio, OR 21.6% ; 95% C.I. 2.7 - 172.5% comparing lowest to highest quartile) and horizontal LV (odds ratio, OR 76.3% ; 95% C.I. 5.2 - 1128.9%) was significantly associated with angle closure. Intra-class correlation for intra-observer reliability for measuring LV was 0.87 (95% C.I. 0.74 - 0.92).

Conclusion: In this cohort of Asian Indians, LV was greater in angle closure eyes when compared to normal eyes. This parameter might be an independent predictor for angle closure disease.

P224 PHYSIOLOGICAL CHANGES IN THE VOLUMES OF IRIS AND ANTERIOR CHAMBER DUE TO DIFFERENT LIGHT CONDITIONS. A QUANTITATIVE STUDY WITH ANTERIOR SEGMENT SWEEP SOURCE OPTICAL COHERENCE TOMOGRAPHY

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Background: A recent report using a time-domain (TD)-optical coherence tomography (OCT) showed that iris volume increased after pharmacologic mydriasis in fellow eyes of acute primary angle closure, whereas it decreased in open angle eyes (Aptel et al. Ophthalmol 2010). The aim of the current study is to quantitatively evaluate the physiological changes in iris volume and anterior chamber (AC) volume due to different light conditions in not only narrow angle eyes but also open angle eyes using an anterior segment swept-source (AS-SS-) OCT, which has much faster scanning speed and higher resolution than the TD-OCT.

Methods: In 19 eyes of 19 subjects with narrow angles (van Herick grade ≤ 2) and 20 eyes of 20 subjects with open angles (van Herick grade > 3), the 360° range of the anterior segments were scanned using an AS-SS-OCT (SS-1000 CASIA, Tomey, Nagoya, Japan) under standardized light (1000 lux) and dark (3 lux) conditions. All subjects had complete images of the anterior segments without the lid coverage. The figures of the iris and AC were manually drawn on B-scan images of the AS-SS-OCT by a single masked examiner (YA) and then the volumes of the iris and AC were automatically calculated.

Results: When the light condition was changed from light to dark, iris volume significantly decreased only in narrow angle eyes (from 38.9 ± 4.12 to 38.3 ± 3.85 mm³, $p = 0.01$, paired t-test) but not in open angle eyes (from 39.5 ± 5.00 to 39.2 ± 4.81 mm³, $p = 0.2$). The changes in iris volume was not significantly correlated with age, axial length, and AC depth (Pearson's correlation coefficient, $p > 0.2$). The change rate of iris volume was significantly correlated with the pupil diameters under light ($R = -0.35$, $p = 0.03$) and under dark ($R = -0.45$, $p = 0.004$), and the changes in pupil diameter ($R = -0.38$, $p = 0.02$), respectively. AC volume significantly increased with the light condition change from light to dark only in open angle eyes (from $151.5 \pm 3.8.8$ to 154.3 ± 39.2 mm³, $p = 0.0001$), but not in narrow angle eyes (from 83.9 ± 15.1 to 84.8 ± 16.3 mm³, $p = 0.1$). The change in AC volume was not correlated with the change rate of iris volume ($p = 0.8$).

Conclusions: When the pupil was physiologically dilated with the light being turned off, the iris volume significantly decreased but the AC volume did not change in narrow angle eyes; while the AC volume increased but the iris volume did not change in open angle eyes.

P225 COMPARISON OF ULTRASOUND BIOMICROSCOPY, TIME-DOMAIN, AND SWEEP-SOURCE ANTERIOR SEGMENTAL OPTICAL COHERENCE TOMOGRAPHY IN EYES WITH NARROW PERIPHERAL ANTERIOR CHAMBER

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Background: The analysis of anterior chamber angle (ACA) configuration is essential for diagnosis and treatment of primary angle closure and its related conditions. Ultrasound biomicroscopy (UBM) has been most commonly used for its non-contact and quantitative evaluation. Recently, in addition to a time-domain anterior segmental optical coherence tomography (AS-OCT) (Visante™, Carl Zeiss Meditec Inc, Dublin, CA), a swept-source AS-OCT, (CASIA™, SS-1000, Tomey Corporation, Nagoya, Japan) also became available. The objective of our study is to evaluate and quantitatively compare the images of (ACA) structures obtained by UBM, time-domain and swept-source AS-OCT.

Methods: A total of 32 otherwise normal right eyes of 32 consecutive subjects who were seen in the University of Tokyo Hospital and had shallow peripheral anterior chamber (Van Herick grade ≤ 2), but no gonioscopic peripheral anterior synechia (PAS) were enrolled. UBM examination (UD-1000™, Tomey), Visante™ and CASIA™ examinations were carried out under standardized light and dark conditions in addition to routine ophthalmologic examinations. ACA configuration parameters, prevalence of appositional closure (APC), the angle opening distance at 500µm from the scleral spur (AOD500), trabecular iris angle (TIA) and angle recess area (ARA) at 3, 6, 9, and 12 o'clock position were each determined on obtained images by a blinded experienced investigator (NM).

Results: Age, refraction and axial length of the subject eyes averaged 70.0 years, +1.58 diopters and 22.4 mm, respectively. APC under the dark condition was found at least in one quadrant in 32/32, 21/32 and 19/32 eyes with UBM, Visante™ and CASIA™, respectively ($p < 0.001$). APC was found in 32/32 in the superior, in 11/32 in the temporal, in 15/32 in the inferior, and in 11/32 eyes in the nasal quadrant under the dark condition with UBM. In the same way, APC was found in 20/32, 7/32, 9/32 and 8/32 eyes with Visante™, and in 20/32, 7/32m 9/32, 8/32 eyes with CASIA™ in each quadrant, respectively. The prevalence of APC was significantly different only in the superior quadrant ($p < 0.001$). Under the dark condition, the average of AOD500 in the superior quadrant was 0.07 (UBM), 0.15 (Visante™) and 0.15mm (CASIA™), that of ARA was 0.04, 0.10, 0.11 mm² and that of TIA was 2.1°, 10.4°, 12.3°, respectively. Only the parameters obtained with UBM in superior quadrant under the dark condition differed from those obtained with other two AS-OCT instruments ($p < 0.001$). There was no significant difference among the ACA configuration parameters obtained with the 3 instruments in other quadrants under the dark condition, or in all quadrants under the light condition.

Conclusions: Given the eyes with narrow peripheral anterior chamber (Van Herick grade ≤ 2) on slit-lamp biomicroscopy, ACA configuration parameters obtained with UBM were significantly different from those obtained with the two AS-OCT

instruments in the superior quadrant under the dark condition, but not in other quadrants under the dark condition or in the light condition.

P226 CORRELATION OF IOP REDUCTION WITH RETINAL NERVE FIBER LAYER THICKNESS CHANGES ON OCT AFTER TREATMENT IN GLAUCOMA PATIENTS

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Background: Correlation of intraocular pressure reduction with retinal nerve fiber layer thickness changes on OCT after treatment in glaucoma patients.

Methods: Retrospective observational case series including 128 eyes of 64 glaucoma patients out of which 99 eyes (77.34%) were managed medically and 29 eyes (22.66%) were managed with surgical treatment. All eyes were imaged with OCT pre-treatment and 3 and 6 months post-treatment to measure peripapillary NFL thickness and IOP readings were recorded with Goldmann Applanation tonometry at both visits.

Results: Mean IOP decreased significantly post-treatment from 19.74 ± 4.82 mmHg to 16.8 ± 3.44 mmHg at 3 months and 15.27 ± 3.80 mmHg at 6 months in the medically managed eyes. Mean IOP decreased post-treatment from 22.86 ± 5.02 mmHg to 16.17 ± 2.62 mmHg at 3 months and 14.17 ± 2.74 mmHg at 6 months in the surgically managed eyes. While the increase in the mean RNFL thickness in the inferior quadrant (IAvg) was correlated with IOP reduction in the medically managed eyes at 6 months ($r = -.252$, $p = 0.022$), the mean increase in the RNFL thickness in the superior quadrant (SAvg) in the surgically managed eyes was correlated with IOP reduction at 6 months ($r = -0.415$, $p = 0.039$).

Conclusion: A significant increase of mean superior and inferior RNFL thickness, which was related to IOP reduction was detected 6 months after Rx. No significant correlation was found between Average RNFL thickness and IOP reduction.

P227 ULTRA-SOUND BIO-MICROSCOPY (UBM) IN PEDIATRIC PRACTICE

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Background: There are certain factors that can make a baby more likely to have vision problems. If a baby is born blind, it is usually because there was a malformation during development, a hereditary condition, an injury at birth or a congenital infection that caused damage.

Methods: Patients at the pediatric age group presenting with congenital glaucoma or different forms of corneal opacities were included in the study. They were evaluated using the Ultrasound BioMicroscopy (UBM) to identify the underlying pathology and undetected malformations in the anterior chamber

Results: Anatomical micro-structural changes detected previously on histo-pathological sections were clearly identified in vivo using the UBM

Conclusion: UBM is a useful tool in pediatric age-group ocular pathology that helps the ophthalmologist in proper

decision making for management of each case separately. It protects the surgeon against unpleasant surprises in case of surgical intervention.

P228 APPLICATION OF ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IN EVALUATING THE MORPHOLOGY AND FUNCTION OF FILTERING BLEBS AFTER TRABECULECTOMY

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Objective: To study the application of anterior segment optical coherence tomography (AS-OCT) in evaluating the morphology and function of filtering blebs after trabeculectomy.

Methods: 103 eyes of 79 patients who had previously undergone trabeculectomy followed up for 1-24 months were selected in this study. These filtering blebs were classified into four types as diffuse-like, cystic-like, encapsulating-like and flatten-like by the slit-lamp microscope and AS-OCT. The consistency between the two methods was evaluated by the Chi-Square test. Intraocular pressure after trabeculectomy with four type filtering blebs was also compared by the t-test.

Results: Observation of the slit-lamp microscope showed diffuse-like blebs in 59 eyes (59/103, 57.28%), cystic-like blebs in 22 eyes (21.36%), encapsulating-like blebs in 8 eyes (7.77%) and flatten-like in 14 eyes (13.59%). AS-OCT imaging showed diffuse-like blebs in 55 eyes (53.39%) with the average intraocular pressure of (12.76 ± 3.97) mmHg, cystic-like blebs in 27 eyes (26.22%) with the average intraocular pressure of (15.07 ± 3.43) mmHg, encapsulating-like blebs in 7 eyes (6.80%) with the average intraocular pressure of (28.40 ± 7.42) mmHg, and flatten-like in 14 eyes (13.59%) with the average intraocular pressure of (23.64 ± 6.43) mmHg. This study found that AS-OCT has fine concordance with the slit-lamp microscope in analyzing the morphology of filtering blebs after trabeculectomy. ($X^2 = 82.95$, $p < 0.05$, Pearson = 0.6679), for intraocular pressure, it also showed a statistically significant difference between diffuse-like and encapsulating-like blebs ($t = 3.205$, $p < 0.01$), a statistically significant difference between diffuse-like and flatten-like blebs ($t = 2.664$, $p < 0.01$), a statistically significant difference between cystic-like and flatten-like blebs ($t = 2.789$, $p < 0.01$) in the average intraocular pressure, there is no significant difference between cystic-like and flatten-like blebs, there is no significant difference between diffuse-like and cystic-like blebs, either no significant difference between encapsulating-like and flatten-like blebs.

Conclusions: AS-OCT is a precise tool with non invasive examination and high resolution, which may visualize the internal structure of filtering bleb, and evaluate the postoperative healing process and the function and efficacy of the blebs.

P229 THE DIAGNOSTIC CAPABILITIES OF EYECAM AND GONIOPHOTOGRAPHY COMPARED TO GONIOSCOPY IN ASSESSING FOR ANGLE CLOSURE

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Purpose: To compare EyeCam™ (Clarity Medical Systems, Pleasanton, CA) and goniophotography in detecting angle closure, using gonioscopy as the reference standard.

Methods: In this prospective, cross sectional study, subjects underwent gonioscopy by a single observer, and EyeCam imaging and goniophotography by different operators. The anterior chamber angle in a quadrant was classified as closed if the posterior trabecular meshwork could not be seen. A masked observer categorised the eyes as per the number of closed quadrants, and an eye was classified as having angle closure if there were two or more quadrants of closure. Agreement between the methods was analyzed by kappa statistic and comparison of area under receiver operating characteristic curves (AUC).

Results: Eighty-five subjects (85 eyes) were included, the majority of whom were Chinese. Angle closure was detected in 38 eyes (45%) with gonioscopy, 40 eyes (47%) using EyeCam and 40 eyes (47%) with goniophotography ($p = 0.69$ in both comparisons, McNemar Test). The agreement for angle closure diagnosis (by eye) between gonioscopy and the 2 imaging modalities was high ($k = 0.86$; 95% Confidence Interval (CI), 0.75-0.97) while the agreement between EyeCam and goniophotography was not as good ($k = 0.72$; 95%CI, 0.57-0.87); largely due to lack of agreement in the nasal and temporal quadrants ($k = 0.55$ – 0.67). The AUC for detecting eyes with gonioscopic angle closure was similar for goniophotography and EyeCam (AUC 0.93, sensitivity = 94.7%, specificity = 91.5%; $p > 0.95$).

Conclusions: Eyecam and goniophotography have similarly high sensitivity and specificity for the detection of gonioscopic angle closure.

P230 MEASUREMENT OF ANTERIOR CHAMBER CHANGES AFTER LASER IRIDOTOMY WITH THE SCHEIMPFLUG SYSTEM (PENTACAM)

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Purpose: to identify the quantitative changes in the angle and anterior chamber depth after laser iridotomy with the Scheimpflug system (Pentacam)

Material and Methods: Prospective study of 26 eyes of 15 white patients with closed or narrow angle in which a laser iridotomy has been performed to prevent acute angle closure glaucoma. Angle width, anterior chamber depth and anterior chamber volume has been measured before and after the iridotomy.

Results: Mean anterior chamber volume increase was 25.22 mm³. The mean anterior chamber depth in the quadrant of the iridotomy increased 0.226 mm, while it increased 0.306 mm in the inferior part. Mean angle width increased 2.656°. No statistically significant changes in central anterior chamber depth were observed.

Conclusions: Anterior chamber depth increased in all eyes, being the change biggest in the quadrant in which the iridotomy was performed and in the inferior part, with no changes in the central depth. Total anterior chamber volume and angle width also increased in all eyes.

P231 ANTERIOR SEGMENT DYSGENESIS IN YOUNGER PATIENTS WITH ANGLE CLOSURE

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Background: Older patients with angle closure amongst a Caucasian population are frequently associated with reduced axial length, increased lens thickness, increased iris thickness, and crowded anterior chambers. This study investigates the causes of angle closure in younger patients using Ultra Biomicroscopy (UBM)

Methods: Twenty patients with angle closure aged 30-55 years underwent UBM using an Aviso Linear 50 MHz probe. Measurements of AC depth, AC width, lens thickness and axial length were made, together with angle-scleral spur distance, and compared to 20 patients with angle closure aged > 60 years. Statistical analysis was by analysis of variance.

Results: Amongst the younger age group mean AC depth was measured as 2.8 mm (s.d. 0.3 mm), AC width at 11.3 mm (s.d. 0.5 mm), Axial length at 23.3 mm (s.d. 1.2 mm), lens thickness at 4.7 mm (s.d. 0.4 mm), and angle to scleral spur distance at 0.2 mm (s.d. 0.03 mm). Amongst the older group mean AC depth was measured at 2.4 mm (s.d. 0.14 mm), AC width at 10.4 mm (s.d. 0.4 mm), Axial length at 22.5 mm (s.d. 1.1 mm), lens thickness at 4.9 mm (s.d. 0.4 mm), and angle to sclera spur distance of 0.4 mm (s.d. 0.02 mm). AC depth, AC width, and axial length were all significantly greater in the younger group, and angle to sclera spur distance significantly shorter compared to the older group. Anteriorly rotated ciliary bodies were noted in 8 patients in the younger group, and 4 patients in the older group. Thin irides were noted in 9 patients in the younger group, but none in the older group.

Conclusions: Younger individuals with angle closure are characterized by deeper and wider AC, longer axial lengths, more anterior iris insertion, and thinner irides when compared to an older group of angle closure patients. We suggest that anterior chamber dysgenesis and plateau iris are the most common causes of angle closure in younger patients.

Clinical Examination Methods: Imaging of the Posterior Segment

P232 COMPARISON OF MEASUREMENT ERROR OF SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY (SD-OCT) AND HEIDELBERG RETINAL TOMOGRAPHY (HRT)

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Background: The purpose of the present study was to compare the intraoperator and interoperator repeatability and within-subject coefficients of variation of measurements of the retinal nerve fiber layer (RNFL) by SD-OCT and stereometric parameters of the optic disk and RNFL by HRT in patients with initial primary open-angle glaucoma (POAG).

Methods: We studied 29 patients (29 eyes) with initial POAG.

Each patient was examined by HRT III (Heidelberg Engineering) and Cirrus HD-OCT (Carl Zeiss Meditec) in one session on the same day. Both methods were performed by 2 experienced operators each taking 2 measurements in turn on one and then on another instrument (total of 8 measurements). Mean RNFL thickness and RNFL thickness in 4 quadrants as measured by SD-OCT and 13 stereometric parameters of the optic disk and RNFL measured by HRT were included into analysis. The repeatability was evaluated by J.M. Bland-D.G. Altman analysis. Within-subject coefficients of variation (wsCV) were calculated using J.M. Bland method.

Results: Mean RNFL thickness measured by SD-OCT demonstrated the best intraoperator and interoperator repeatability and the lowest variability. Its intraoperator wsCV (mean for 2 operators: 1.86%) was 3 times lower as compared to the wsCV of the best HRT stereometric parameter – rim area (5.36%), and it was 7 times lower as compared to the wsCV of the mean RNFL thickness measured by HRT III (13.04%).

Conclusions: RNFL study by the method of SD-OCT with Cirrus HD-OCT demonstrates high repeatability and low variability, especially of the mean RNFL thickness. The measurement error of SD-OCT is much lower as compared to HRT and provides for the most stable results of the RNFL examination in patients with initial POAG.

P233 THE COMPARATIVE ANALYSIS RETINOTOMOGRAPHY AND HISTOLOGIC RESEARCH OF A RETINA IN NORM AND AT PRIMARY OPEN-ANGLE GLAUCOMA

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Background: The purpose of research – the comparative characteristic of a structural condition of a retina of an eye according to an optical coherent tomography (OCT) and histologic research of a retina in norm and at primary open-angle glaucoma.

Methods: 76 person (138 eyes) with primary open-angle glaucoma and 22 healthy persons (40 eyes) are surveyed with application of a method spectral OCT on device Cirrus HD-OCT 4000 (Germany). To fourteen patients with a terminal glaucoma it has been executed enucleating the amazed eye with the subsequent histologic research of a retina.

Results: At OCT-research it is noted, that reduction of volume and thickness of the macula in process of progressing glaucoma is connected not only with reduction NFL and GCL, but with reduction of thickness of all layers of a retina. So, INL participates in reduction of thickness macular zones equally with GCL. It is revealed reduction of thickness complex RPE + IS/OS in process of progressing a glaucoma, mainly, due to reduction a hyporeflexive layer between membrane Virhofs and the most external hyperreflexive layer pigmentary epithelium down to its disappearance and merge of two hyperreflexive strips in one line. Decrease in shielding ability pigmentary epithelium retinas in the form of expansion of a zone of penetration of light at a level horoidei is revealed. Depth of penetration of coherent light in horoidei accrues in process of development of glaucoma. At an estimation of histologic structure of external layers of a retina in opinion of with a terminal glaucoma, it is revealed reduction of thickness and under pressure of an external and internal nuclear layer, and also atrophy with formation of microcysts in an external

mesh layer and in a layer of external segments of photoreceptors. Migration of individual kernels of bipolar cells in an external mesh layer that can be connected with loss by nervous cells of a support in the form of a network of nervous shoots is noted. Besides it is revealed reduction of thickness a layer pigmentary epithelium retinas with the centers of an atrophy caused by destruction epitheliocits. Migration of individual pigmentary cells in neurosensors a layer is found out.

Conclusion: Thus, retinotomography the picture at a glaucoma practically coincides with structural infringements in a histologic picture of preparations that specifies adequacy of OCT-research of a retina. Are found out retinotomography attributes of involving of external layers of a retina in process of glaucoma, diseases accruing in process of development.

P234 COMPARISON OF GLAUCOMA DIAGNOSIS USING STRATUS AND CIRRUS OPTICAL COHERENCE TOMOGRAPHY IN TAIWAN CHINESE POPULATION

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Background: To compare the glaucoma diagnostic power between Stratus and Cirrus OCT in Taiwan Chinese population.

Methods: One eye each was chosen from 21 ocular hypertension (OH), 27 glaucoma suspect (GS), 35 primary open-angle glaucoma (POAG), 26 primary angle closure glaucoma (PACG) and 52 normal subjects. Early glaucoma (EG) was recruited from glaucomatous eyes based on visual field severity (better than -9 dB). All participants were imaged by the same observer at the same visit. The area under the receiver operator characteristic (AROC) curve was used to differentiate normal from OH, GS, POAG, PACG and EG eyes; and the sensitivity/ specificity of each parameter from internal normative classification was analyzed.

Results: For normal versus OH, the best AROC value was average thickness (Stratus, 0.693; Cirrus, 0.697). For normal versus GS, the best AROC value was average thickness (Stratus, 0.807; Cirrus, 0.776). For normal versus POAG, the best AROC value was average thickness (Stratus, 0.943; Cirrus, 0.930). For normal versus PACG, the best AROC value was 5 o'clock hour (Stratus, 0.830; Cirrus, 0.817). For normal versus EG, the best AROC value was average thickness in Stratus (0.868) and 5 o'clock hour in Cirrus (0.876). However, all sensitivities in 5 groups were fair from the internal normal classification database in both OCTs.

Conclusions: Although Cirrus and Stratus OCTs show promising in early glaucoma detection; and two OCTs show equal glaucoma diagnostic power. The feasibility of internal normative database for Chinese population should be addressed.

P235 LINEAR CORRELATION OF PERIMETRIC RETINAL SENSITIVITY IN CENTRAL VISUAL FIELD AND PERIPAPILLARY RETINAL NERVE FIBER LAYER THICKNESS MEASURED BY OCT – OWN OBSERVATION

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Background: Previously, both linear and non linear correlation between retinal sensitivity in central visual field and peripapillary retinal nerve fiber layer thickness in glaucoma as well as varying level of correlation for each retinal sector were employed, depending on the stage of progression of the disease. Provided that those parameters are of increasing use, a retrospective study was conducted to describe the relationship.

Methods: 32 females and 27 males, of mean age of 63, patients of Glaucoma Clinic of Ophthalmology Department of Wroclaw Medical University were included in the study. The patients of Polish descent, suffering from open angle glaucoma as well as those with suspected glaucoma were chosen. Octopus 101 perimeter and TOP strategy, G2 program were used for visual field evaluation. For measurements of RNFL thickness Stratus OCT and fast RNFL thickness scan was engaged.

Results: Statistically significant linear correlation between retinal sensitivity in central visual field and peri-papillary retinal nerve fiber layer thickness was found in all the examined sectors in glaucomatous eyes with confirmed diagnosis as well as in the suspected ones. The strongest correlation was established for inferior retinal nerve fiber layer sector, corresponding with upper sector of visual field. The weakest correlation, but still statistically significant, was found for RNFL thickness in nasal sector and visual field in temporal sectors. The greatest mean RNFL thickness was described for inferior sectors (108 μm), the smallest – in temporal sectors (64 μm), which is in agreement with ISNT rule.

Conclusion: Optical coherence tomography as well as perimetry are classical tools in glaucoma screening and monitoring. Not to be underestimated is fact of their high linear correlation in describing the peri-papillary retinal nerve fiber layer thickness and retinal sensitivity in central visual field both in open angle glaucoma and glaucoma suspected eyes in all the sectors. Although, the attention must be paid to varying degree of correlation depending on the localization of the visual field errors and RNFLT losses.

P236 INFLUENCE OF OPTIC DISC SIZE ON THE DIAGNOSTIC PERFORMANCE OF MACULAR GANGLION CELL COMPLEX AND PERIPAPILLARY RETINAL NERVE FIBER LAYER ANALYSES IN GLAUCOMA

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Background: To evaluate the influence of optic disc size on the diagnostic accuracy of macular ganglion cell complex (GCC) and conventional peripapillary retinal nerve fiber layer (pRNFL) analyses provided by spectral domain optical coherence tomography (SD-OCT) in glaucoma.

Methods: A total of 82 glaucoma patients and 30 healthy subjects were included. All patients underwent GCC thickness (a 7x7 mm macular grid, consisting of RNFL, ganglion cell layer and inner plexiform layer) and pRNFL thickness measurement (3.45 mm circular scan) by SD-OCT. Whenever both eyes were eligible, one was randomly selected for analysis. Initially, receiver operating characteristic (ROC) curves were generated for different GCC and pRNFL param-

eters. The effect of disc area on the diagnostic accuracy of these parameters was evaluated using a ROC regression model. Subsequently, we arbitrarily chose 1.5, 2.0 and 2.5 mm² disc sizes (based on the distribution of our data) and compared the predicted areas under the ROC curves (AUCs) and sensitivities at fixed specificities for each of them.

Results: Average MD (mean deviation index) for glaucomatous eyes was -5.3 ± 5.2 dB. Similar AUCs were found for the best pRNFL (average thickness = 0.872) and GCC parameters (average thickness = 0.824; $p = 0.19$). The coefficient representing disc area in our ROC regression model was not statistically significant for average pRNFL thickness (-0.176) or average GCC thickness (0.088 ; $p \geq 0.56$). AUCs for fixed disc areas (1.5, 2.0, and 2.5 mm²) were 0.904, 0.891, and 0.875 for average pRNFL thickness and 0.834, 0.842 and 0.851 for average GCC thickness, respectively. The highest sensitivities at 80% specificity for average pRNFL (84.5%) and GCC thicknesses (74.5%) were found with disc sizes fixed at 1.5 mm² and 2.5 mm², respectively.

Conclusions: Diagnostic accuracy was similar between pRNFL and GCC thickness parameters. Although not statistically significant, there was a trend for a better diagnostic accuracy of pRNFL thickness measurement in cases of smaller discs. For GCC analysis, an inverse effect was observed.

P237 MACHINE-LEARNING CLASSIFIERS ENHANCE THE DIAGNOSIS OF GLAUCOMA USING HIGH-DEFINITION OPTICAL COHERENCE TOMOGRAPHY

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Background: Isolated optic nerve head (ONH) and retinal nerve fiber layer (RNFL) parameters from HD-OCT (Cirrus Version 4.5.1.1, Carl Zeiss Meditec, Dublin, CA) have shown good diagnostic performance. Researchers have utilized machine-learning classifiers such as Linear Discriminant Analysis (LDA) and Classification And Regression Tree (CART) to enhance the performance of glaucoma parameters.

Purpose: To evaluate the diagnostic performance of machine-learning classifiers in comparison to the ONH and RNFL parameters for discriminating normal from glaucomatous eyes.

Methods: Consecutive glaucoma patients and normal subjects recruited from an ongoing population based study underwent imaging with the Cirrus HD-OCT using the Optic Disc Cube 200x200 scan protocol (software v5.0.0) for measurement of peripapillary ONH and RNFL parameters. Individual values for area under the receiver operator characteristic curves (AUC) for ONH and RNFL parameters were computed and compared with machine learning classifiers (LDA and CART).

Results: 508 normal subjects were compared with 184 glaucoma subjects. Majority of the glaucoma subjects were Chinese (157/184, 85.3%). Average RNFL thickness (0.92), Inferior RNFL thickness (0.92), Vertical Cup-Disc Ratio (0.91) and Rim area/Disc area ratio (0.90) performed better than the other ONH and RNFL parameters. Machine-learning clas-

sifiers resulting from LDA (0.96) and CART (0.98) outperformed all the individual parameters for diagnostic accuracy. Misclassification rates in LDA and CART were found to be very low (8% and 5.6% respectively). Discrimination of mild glaucomatous eyes from normal eyes were lower compared to eyes with moderate glaucoma using LDA compared to CART (0.94 vs 0.98).

Conclusion: Machine-learning classifiers resulting from LDA and CART can be utilized in spectral domain Cirrus HD-OCT analysis for glaucoma discrimination.

P238 OBSERVATION AND MORPHOMETRY OF THE GLAUCOMATOUS LAMINA CRIBROSA USING SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY (SD-OCT)

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Purpose: To observe and measure the lamina cribrosa in OAG patients using spectral domain optical coherence tomography (SD-OCT).

Methods: This study included 30 OAG patients (17 with POAG and 13 with NTG). All of the patients were examined using SD-OCT (3D-OCT1000 Mark II, Topcon), and the pores of the lamina cribrosa were clearly observed. The average age was 58.1 ± 11.0 years (mean \pm standard deviation) and the MD value of the Humphrey visual fields (HVF) was -15.3 ± 7.2 dB. After acquiring the OCT images using the choroidal mode, the images were reconstructed three dimensionally and transverse sections of the lamina cribrosa were examined. Three sections (surface, middle, and depth) were recorded 35 μ m each from the surface. Based on the densities of these images, the laminar pores were identified from the beams or vasculature and then the mean pore area and pore ratio against the laminar beams were calculated and compared.

Results: While the mean pore area was $901.6 \pm 44.0 \mu\text{m}^2$, the mean pore ratio was $10.3 \pm 0.76\%$. Both the pore area and ratio became statistically smaller as the measurements moved from the surface to depth sections ($p = 0.0384$ and $p = 0.0470$, paired t-test). The pore area and ratio were $885.9 \pm 44.4 \mu\text{m}^2$ and $10.3 \pm 0.87\%$ in POAG patients, and $922.1 \pm 35.4 \mu\text{m}^2$ and $10.4 \pm 0.61\%$ in NTG patients, respectively. The pore area was larger in NTG patients than POAG patients ($p = 0.0161$, unpaired t-test), but the pore ratios were similar ($p = 0.9167$). Neither the pore area nor pore ratio significantly correlated with patient age, VFI or MD of HVF. The measurements in this study are reliable because the reproducibility was $2.82 \pm 1.88\%$ and $2.78 \pm 1.97\%$ for the pore area and pore ratio, respectively.

Conclusion: The glaucomatous lamina cribrosa can be observed and measured using SD-OCT. This technique should be useful despite some methodological issues and limitations. It may be possible to detect alterations in the lamina cribrosa during the onset and progression of glaucomatous optic neuropathy.

P239 ABSTRACT WITHDRAWN

P240 THE CONFOCAL SCANNING LASER OPHTHALMOSCOPY SUBSTUDY TO THE EUROPEAN GLAUCOMA PREVENTION STUDY (EGPS): STUDY DESIGN AND BASELINE FACTORS

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Purpose: To describe the study design and baseline factors of the Confocal Scanning Laser Ophthalmoscopy (HRT) ancillary study within the EGPS. This study was designed to examine the relationship between HRT optic disk topographic measurements and baseline demographic and ocular factors.

Methods: Four-hundred eighty-nine eyes of 489 ocular hypertensive participants from 4 centers within the EGPS were investigated in this substudy. Each participant completed HRT imaging at least annually. Mean images for each image series were computed using software version 3.0. Contour line drawing and quality control was performed by two experienced glaucoma specialists at the HRT reading center Mainz, trained by the OHTS HRT reading Center. The association between the results of optic disk topography measurements and intraocular pressure (IOP), central corneal thickness (CCT), baseline photographic estimates vertical cup disk ratio, asymmetry between the two eyes in cup to disk ratio, and baseline visual field indices (pattern standard deviation, PSD) was assessed using regression analysis (univariate and multivariate).

Results: 489 eyes of 489 participants showed good quality images and could be included. Associations between optic disk topography measurements and vertical cup disk ratio were found for almost all stereometric optic disk parameter in both univariate and multivariate analysis. The strongest association was found between vertical cup disk measurements and disk, cup, and rim area, cup and rim volume, cup disk area ratio, linear cup disk area ratio, mean and maximum cup depth (all $p < 0.0001$). In multivariate analysis furthermore, significant associations were found between PSD, disk area, and HRT optic disk measurements (disk, cup, and rim area, cup and rim volume, cup disk area ratio, linear cup disk area ratio, and mean cup depth, $p < 0.05$).

Conclusions: The EGPS is the first multicenter, placebo-controlled randomized clinical trial to use HRT for monitoring optic disk changes in participants with ocular hypertension. We found strong associations between vertical cup disk ratio estimates, disk area, PSD, and HRT stereometric parameters.

P241 RELATIONSHIP BETWEEN RTVue MEASUREMENTS AND HFA 10-2 PARAMETERS

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Background: Recent improvements in retinal imaging with optical coherence tomograph (OCT) make it possible to detect the structural changes in glaucomatous optic neuropathy. Here, we assess the relationship between central visual field sensitivity and retinal structure measured by

spectral-domain OCT in primary open-angle glaucoma (POAG) eyes.

Methods: Right eyes of sixty-six POAG patients were enrolled (average age: 57.9 ± 12). As central visual field functional indexes, mean deviation (MD), superior total deviation (sup TD), inferior total deviation (infTD) were derived using Humphrey field analyzer (HFA) central 10-2 SITA standard program. OCT measurements [average RNFL thickness (avgRNFL), superior and inferior avgRNFL (supRNFL, infRNFL), average ganglion cell complex thickness (avgGCC), superior and inferior avgGCC (supGCC, infGCC)] were obtained using RTVue-100. Correlation between each HFA parameter and OCT measurement was calculated. Additionally, correlation between foveal thresholds and OCT parameters (avgRNFL, avgGCC, TU1, TL1) was also calculated. All regression analysis was based on linear regression model.

Results: The correlation coefficients (r) between MD and avgRNFL, avgGCC were 0.484, 0.518, respectively. The association of hemi-field total deviation with sectoral RNFL (supTD, $r = 0.385$; inf TD, $r = 0.579$) and sectoral GCC (supTD, $r = 0.525$; infTD, $r = 0.694$) was moderate. TL1 have the stronger relationship with foveal threshold ($r = 0.703$) than avgRNFL ($r = 0.415$), avgGCC ($r = 0.556$) and TU1 ($r = 0.612$).

Conclusion: In POAG eyes, the RNFL and GCC measurements using spectral-domain OCT reflect the central visual field function.

P242 AGREEMENT BETWEEN TIME-DOMAIN OCT (STRATUS OCT), AND SPECTRAL-DOMAIN OCT (CIRRUS HD OCT), FOR MEASURING PERIPAPILLARY RETINAL NERVE FIBER LAYER THICKNESS

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Background: To determine the agreement between peripapillary retinal nerve fiber layer (RNFL) thickness measurements obtained with a time-domain optical coherence tomography (Stratus® OCT Carl Zeiss), and with a spectral-domain OCT (Cirrus HD® OCT Carl Zeiss) in normal subjects and subjects with ocular hypertension and glaucoma.

Methods: A total of sixty four eyes from normal subjects (23), ocular hypertension (22) and glaucoma patients (19) were analyzed. Assessment of the peripapillary RNFL thickness were made using the 'Fast RNFL Thickness (3.4)' (Stratus OCT) and the 'Optic Disc Cube 200x200' (Cirrus HD-OCT) acquisition protocol. The relationship between RNFL thickness measurements of the 2 OCTs were evaluated using a Pearson/Spearman correlation analysis. The RNFL thickness measurements (average, quadrant and clock-hour RNFL Thickness) were then compared (paired t test/Wilcoxon test). $p < 0.001$ was considered to be statistically significant. Statistical analyses were performed using SPSS software version 16.0.0 (SPSS Inc., Chicago, Illinois, USA)

Results: All RNFL thickness measurements determined by the two OCT machines were highly correlated, with the association being particularly strong for the inferior RNFL Thickness (Pearson $r = 0.973$; $p < 0.001$). For Stratus OCT, the

average RNFL thickness (mean \pm standard deviation) was $102.3 \pm 13.94 \mu\text{m}$, $95.46 \pm 10.45 \mu\text{m}$ e $68.01 \pm 12.91 \mu\text{m}$ for the normal, ocular hypertensive and glaucoma group. For Cirrus HD OCT, the corresponding measurements were $93.65 \pm 11.27 \mu\text{m}$, 84.31 ± 7.89 and $67.05 \pm 8.97 \mu\text{m}$. All Stratus-Cirrus differences were statistically significant by paired t testing / Wilcoxon ($p < 0.001$) except for the superior, 1, 2, 9, 10 and 11 o'clock group. With those differences (Stratus measurements > Cirrus measurements) been less pronounced in the glaucoma group.

Conclusions: Glaucoma is a progressive disease so longitudinal follow-up for tracking a glaucomatous – functional and/or structural – change is crucial. Assessment of RNFL thickness is of diagnostic significance in glaucoma. Although time-domain OCT (Stratus OCT) has been the prevailing OCT instrument for glaucoma structural assessment, the recent introduction of spectral-domain OCT offers a faster scan speed and a higher image resolution for RNFL imaging. Our study indicates that RNFL thickness measured by the Cirrus HD OCT and Stratus OCT showed considerable discrepancy (Stratus RNFL measurements > Cirrus HD RNFL measurements), although the 2 measurements were strongly correlated. Due to differences in image quality, scan registration technologies, as well as differences in the image segmentation algorithm between the two devices, measured RNFL thickness is not directly compared, and patients should not be scanned back and forth with each instrument, which would introduce too much variability to detect any change over time. A calibration equation needs to be established between the OCT generations.

P243 COMPARISON OF SPECTRAL-DOMAIN OCT AND TIME-DOMAIN OCT ON THE ABILITY TO DETECT LOCALIZED RETINAL NERVE FIBER LAYER DEFECTS IN PATIENTS WITH NORMAL STANDARD AUTOMATED PERIMETRY

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Background: Spectral-domain (SD) optical coherence tomography (OCT) can be expected to have better discriminating ability for glaucoma diagnosis compared with time-domain (TD) OCT based on their advantages include a faster scan and higher-resolution imaging of retinal nerve fiber layer (RNFL). SD-OCT also can determine RNFL thickness by re-sampling the collected data. However, some investigations reported that the discriminating ability between TD-OCT and SD-OCT was comparable for detection of moderately advanced glaucoma. We evaluate and compare the diagnosis ability of direct scanning (RNFL 3.45 mode) and re-sampling from datasets (ONH mode) by SD- OCT and direct scanning by TD- OCT to detect localized RNFL defects in patients with normal standard automated perimetry (preperimetric glaucoma).

Methods: Twenty-five eyes of 25 subjects with preperimetric glaucoma and 33 eyes of 33 normal subjects were studied. The RNFL thickness was measured in ONH and RNFL 3.45 modes by SD-OCT (RTVue-100, Optovue, Inc., Fremont, CA) and in fast RNFL 3.4 mode by TD-OCT (Stratus OCT, Carl Zeiss Meditec Inc., Dublin, CA). Stratus OCT provides RNFL thickness maps including an average, four quadrants and 12

clock hours, whereas RTVue-100 provides 16 regional RNFL thickness maps using either ONH or RNFL 3.45 modes. RNFL thickness data from the four regions of any quadrant were averaged for comparison with Stratus OCT. Based on the internal normative database from each device the sensitivity and specificity for detecting localized RNFL defects were calculated. The areas under receiver operating characteristic curves (AUROC) for discrimination between preperimetric glaucoma and normal were compared between three RNFL measurements.

Results: There were 10 localized RNFL defects in the superotemporal and 17 localized RNFL defects in the inferotemporal and it was 27 RNFL defects in total. The sensitivity of ONH parameters ranged from 36% to 96% and that of RNFL 3.45 parameters ranged from 32% to 100% and that of fast RNFL 3.4 parameters ranged from 4% to 56%. The specificity of ONH parameters ranged from 57.6% to 100% and that of RNFL 3.45 parameters ranged from 57.6% to 100% and that of fast RNFL 3.4 parameters ranged from 75.8% to 100%. The best AUROC of three different RNFL thickness measurements was similar [AUROC = ONH 0.863 (16 regional thickness: IT2), RNFL 3.45 0.865 (average thickness), fast RNFL 3.4 0.872 (7 o'clock sector)].

Conclusions: Based on the internal normative database, SD-OCT (ONH and RNFL 3.45) had generally higher sensitivities than TD-OCT. ONH and RNFL 3.45 modes have similar sensitivities. However, there were no significant differences between the AUROC for three different RNFL thickness measurement methods.

P244 REPRODUCIBILITY OF PERIPAPILLARY RETINAL NERVE FIBER LAYER THICKNESS MEASUREMENTS WITH SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY IN NORMAL AND GLAUCOMATOUS EYES

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Background: Spectral domain optical coherence tomography (OCT) marks a great advance in ocular imaging, with faster scanning time, higher resolution and reduced motion artifact compared to time domain OCT. In order to distinguish normal from abnormal test findings, as well as for serial follow up of patients and for monitoring progression, it is essential that the test results have a high degree of reproducibility. A change in the results of any test can be considered to be attributable to an ongoing disease process only if the magnitude of the change is in excess of the reported test-retest variability. This study aimed to determine the intrasession as well as inter-session reproducibility of peripapillary retinal nerve fiber layer (RNFL) thickness measurements with the spectral domain Cirrus OCT (Carl Zeiss Meditec, Dublin, CA, USA) in normal and glaucomatous eyes.

Methods: Forty eyes of 40 normal subjects and 40 eyes of 40 glaucomatous patients were included in the study. RNFL measurements were obtained on the Cirrus OCT five times in a single day (for intrasession reproducibility) and on five separate days (for inter-session reproducibility) by a single experienced operator. Intraclass correlation coefficient (ICC), coefficient of variation (COV) and test-retest variability values were calculated for mean RNFL thickness as well as RNFL thickness in four quadrants. A subgroup analysis was done

to determine reproducibility parameters in a subset of patients with advanced glaucoma, defined as mean deviation (MD) worse than -12 decibels (dB) on Humphrey visual field testing (Carl Zeiss-Humphrey Systems, Dublin, CA).

Results: Intrasession reproducibility: The ICC, COV and test retest variability values for mean RNFL thickness in normal eyes were 0.993, 1.96% and 4.02 μm respectively. The corresponding values in glaucomatous eyes were 0.996, 2.39% and 3.84 μm . In eyes with advanced glaucoma, these values were 0.996, 2.41% and 3.70 μm respectively. For quadrants, ICC was 0.9 or higher and COV was under 6% in all groups. Test-retest variability was maximum for temporal quadrant measurements in all groups.

Inter-session reproducibility: The ICC, COV and test retest variability values for mean RNFL thickness in normal eyes were 0.992, 2.16% and 4.09 μm respectively, while the corresponding values in glaucomatous eyes were 0.995, 2.62% and 3.98 μm . For eyes with advanced glaucoma, these parameters were 0.990, 2.70% and 4.16 μm . For quadrants, ICC was 0.89 or higher and COV was under 8% in all groups. Test-retest variability was maximum for temporal quadrant measurements in all groups.

Conclusions: Peripapillary RNFL thickness measurements using the spectral domain Cirrus OCT demonstrated excellent reproducibility in normal as well as glaucomatous eyes, including the sub-group of eyes with advanced glaucoma. This may be an advantage over the time domain OCT, in which reproducibility is reportedly lower in advanced glaucoma. In our study, intrasession and inter-session test-retest variability did not exceed 5 μm for mean RNFL thickness.

P245 IN-VIVO, 3D IMAGING OF NORMAL LAMINA CRIBROSA STRUCTURES INCLUDING HORIZONTAL CENTRAL RIDGE AND LAMINA CRIBROSA DEFORMATION IN GLAUCOMA

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Background: Histologic and imaging studies have demonstrated structural changes of the lamina cribrosa (LC) in glaucoma. However, histologic processing of specimens may lead to alterations of the architecture seen in vivo, and conventional optical coherence tomography (OCT) has limited ability to image the entire LC in detail. We evaluated the morphology and position of the normal LC and its structural changes in high-tension glaucoma (HTG) using enhanced depth imaging spectral-domain OCT (EDI SD-OCT).

Methods: We obtained serial horizontal and vertical B-scans of the optic nerve head (ONH) using EDI SD-OCT for one eye of each HTG and normal subject, and reconstructed 3D images of the LC. Horizontal and vertical diameters of the LC and the optic disc were measured in normal subjects. Mean and maximum LC depths were measured in 11 equally spaced horizontal B-scans, and the depth of LC insertion was measured at 32 points along its circumference (reference plane: Bruch's membrane edges) (Fig A,B). The angle of ONH tilting was also measured in the B-scan along the horizontal midline (Fig B). Depth profiles were compared between the two groups.

Results: A total of 56 HTG (visual field [VF] mean deviation,

-16.2 ± 3.1 dB) and 31 normal subjects were included. In normal subjects, horizontal and vertical diameters of the LC were significantly correlated with each other ($p = 0.02$), and the ratio of horizontal to vertical diameters of the LC had no significant correlation with that of the optic disc or with the angle of ONH tilting ($p > 0.3$). 3D imaging (Fig C, arrows) and W-shaped depth profiles of the LC and LC insertion in normal subjects (Fig D, E) revealed a previously undescribed horizontal central ridge. The vertical diameter of LC and the angle of optic nerve tilting had a significant negative correlation with LC depth ($p < 0.03$). Mean and maximum LC depths in the HTG group were significantly greater before and after controlling for those factors (posterior bowing, Fig D). The LC insertion depth in the HTG group was significantly greater in the superior and inferior regions (posterior sliding of LC insertion, Fig E). The depths of LC and LC insertion in the eyes with a VF defect limited to the superior hemifield were significantly greater than those in normal subjects in the inferior region (Fig F, G), where the retinal nerve fiber layer (RNFL) was significantly thinner than normal subjects ($p < 0.01$).

Conclusions: The shape of the LC has no significant correlation with the shape of the optic disc or with the angle of ONH tilting. Mechanisms of LC deformation in HTG include posterior bowing of the LC and posterior sliding of the LC insertion. Localized LC deformation corresponds to regions of RNFL and VF defects. The horizontal central ridge appears to act as a LC structural support and be less affected by elevated intraocular pressure. This finding explains lower susceptibility of cecocentral and temporal visual fields in glaucoma.

P246 A NOVEL METHOD TO DETECT LOCAL GANGLION CELL LAYER LOSS IN GLAUCOMA BY USING SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY
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Background: Initial glaucomatous damage is thought to occur as a local loss of retinal ganglion cells, particularly in eyes with nerve fiber layer defects. We developed a new method to detect local retinal ganglion cell (RGC) loss by using spectral-domain optical coherence tomography (SD-OCT). This method is based on the 2-dimensionally symmetric structure of ganglion cell layer (GCL). In this paper, we investigated the glaucoma discriminating ability of this method.

Methods: We examined 33 eyes of 21 patients with glaucoma and 36 normal eyes of 22 volunteers. Automated measurement of the thickness of combined GCL and inner plexus layer (termed GCL complex) was developed on a macular cube scan in Cirrus (Carl Zeiss Meditec). We designed an elliptical annulus (inner vertical radius, 0.5 mm; outer vertical radius, 2 mm) that was stretched in the horizontal direction by 20%. We calculated the mean GCL complex thickness for each of the 180 spokes that extend from the inner radius to the outer radius. The spoke with the minimum average value was assumed to indicate the location of the maximum local thinning of the GCL like a compass. The directional angle was assessed in the clockwise direction in the right eye (0-360 degrees) and counterclockwise direction in the left

eye. The area under the receiver operating characteristic curve (AROC) was used to compare the glaucoma discriminating ability of the minimum average value and the circum-papillary retinal nerve fiber layer (cpRNFL) thickness.

Results: The average mean deviation in standard automated perimetry was -4.74 ± 4.12 (mean ± SD). The minimum average value of the GCL complex thickness on spokes was 82.9 μm in normal eyes and 61.5 μm in eyes with glaucoma; the difference between these values was statistically significant ($p < 0.0001$). The location of the minimum average value was 2–164 degrees (42.3 ± 41.0 degrees) in the superior hemisphere and 215–349 degrees (325.3 ± 46.3 degrees) in the inferior hemisphere. The AROC of the minimum average value of GCL complex thickness was 0.941 and that of cpRNFL was 0.963.

Conclusion: Glaucoma discriminating ability of the minimum average value in our spoke method was comparable to that of cpRNFL thickness. Thus, this method may be useful in the detection of local RGC loss.

P247 CORRELATION BETWEEN STRUCTURAL PARAMETERS OF OPTIC NERVE HEAD AND RETINAL NERVE FIBER LAYER THICKNESS, WITH OPTIC DISC SIZE, IN NORMAL SUBJECTS

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Background: To assess the correlation between morphological parameters of the optic nerve head and retinal nerve fiber layer (RNFL) thickness measurements, with optic disc size, in a population of normal subjects.

Methods: Prospective observational study. Structural parameters of the optic nerve head were evaluated by means of confocal scanning laser ophthalmoscopy (Heidelberg Retina Tomograph III: HRT-III). The HRT parameter, disc area, was used to determine optic disc size. RNFL measurements were performed by means of optical coherence tomography (OCT) and GDx-VCC scanning laser polarimetry. Pearson correlation coefficients (r) were calculated between RNFL thickness measurements, morphological parameters of the optic nerve head, and optic disc size. A $p < 0.05$ value was considered with statistical significance.

Results: Ninety-two eyes of 92 normal subjects were included in the study. It was observed a positive and significant correlation between different RNFL parameters assessed by OCT and optic disc size; specifically, global RNFL average thickness ($r = 0.269$) and thickness of the RNFL segment corresponding to the 11 hour-position ($r = 0.343$). None of the RNFL parameters assessed by GDx showed any significant correlation. On the other hand, most of the morphological optic disc parameters evaluated by means of HRT-III showed significant correlations with optic disc size, particularly cup area ($r = 0.721$).

Conclusion: The correlation between RNFL thickness and rim area with optic disc size determines that, optic disc size must be considered in the evaluation of data obtained by means of image devices in clinical practice.

P248 COMPARISON OF RETINAL NERVE FIBER LAYERS MEASUREMENTS USING TIME DOMAIN OPTICAL COHERENCE TOMOGRAPHY AND SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY FOR GLAUCOMA SUSPECT AND NORMAL-TENSION GLAUCOMA

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Purpose: To determine the correlation between retinal nerve fiber layer(RNFL) thickness measurements from time domain optical coherence tomography (Stratus OCT™) and spectral domain optical coherence tomography (Cirrus HD-OCT™) for glaucoma suspect and normal-tension glaucoma.

Methods: Stratus OCT™ and Cirrus HD-OCT™ were scanned by the same examiner on the same day to measure and compare the retinal nerve fiber layer thickness for 44 eyes of 23 glaucoma suspect and normal-tension glaucoma patients from March to August 2010 in Sung Mo Eye Hospital.

Results: When compared the RNFL thickness by disease, normal-tension glaucoma has significantly thinner than glaucoma suspect in superior, inferior, temporal quadrant and 5, 6, 7, 8, 11 and 12 microns depending on clock hour by Stratus OCT™ and in superior, inferior, temporal quadrant and 2, 5, 7, 8, 10, 11 and 12 microns depending on clock hour by Cirrus HD-OCT™ ($p < 0.05$). When compared the RNFL thickness by two machines, Cirrus HD-OCT™ measurements tended to be thinner than Stratus OCT™ from all directions in glaucoma suspect and from all directions except 3 and 7 O'clock directions in normal-tension glaucoma ($p < 0.05$).

Conclusion: RNFL thickness measurements in glaucoma suspect and normal-tension glaucoma patients scanned with Cirrus HD-OCT™ correlate well with those from Stratus OCT™. The thickness on the same region are likely to be thinner by Cirrus HD-OCT™ than Stratus OCT™. However, more comparative studies are needed to evaluate measurement values from various diseases and measurement values from spectral domain optical coherence tomography.

P249 IMAGING AND DETECTION OF LOCALIZED PRE-PERIMETRIC RETINAL NERVE FIBER LAYER DEFECTS IN GLAUCOMA USING SPECKLE-NOISE-REDUCED SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY

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Background: Nerve fiber layer defects (NFLDs) precede the development of visual field defects in eyes with glaucoma. Automated detection of narrow NFLDs is useful for pre-perimetric glaucoma diagnosis. Although circumpapillary retinal nerve fiber layer (cpRNFL) thickness measured using optical coherence tomography (OCT) has the greatest ability to discriminate glaucoma, its sensitivity for detecting localized NFLDs in patients with pre-perimetric glaucoma is reportedly poor. Speckle-noise-reduction using spectral-domain OCT (SD-OCT) improves visualization and enables measurement of NFLDs. This study aimed to determine whether improved visualization of NFLDs by this method improves automated detection of NFLDs in patients with pre-perimetric glaucoma.

Methods: Twenty-eight eyes of 28 patients with NFLDs and pre-perimetric glaucoma, detected on color fundus photographs, were examined using Spectralis™ HRA+OCT (Heidelberg Engineering), single-scan time domain OCT (TD-OCT; Stratus OCT), and SD-OCT (RTVue-100). To reduce speckle noise in cpRNFL images, we averaged 16 cpRNFL B-scans. The presence of NFLDs was defined as abnormal thinning of the cpRNFL ($p < 1\%$) at least in a part of a sector map. Alternatively, NFLDs were judged to be present when the mean cpRNFL thickness curve crossed the red zone ($p < 1\%$) in the cpRNFL thickness map. NFLD detection based on these 2 definitions was compared among single-scan TD-OCT, single-scan SD-OCT, and images with reduced speckle noise.

Results: A total of 35 NFLDs were detected in the 28 eyes examined. Spectralis significantly improved sensitivity for detecting NFLDs according to the sector abnormality ($p < 1\%$), as compared to Stratus OCT (17.1% versus 48.6%; $p = 0.001$); however, the sensitivities achieved using Spectralis and Optovue were similar (45.7% versus 48.6% $p = 1.000$). Spectralis significantly improved sensitivity for detecting NFLDs according to the cpRNFL thickness map, as compared to Stratus OCT (31.4% versus 88.6%; $p = 0.001$) and RTVue-100 (62.9% versus 88.6%; $p = 0.021$).

Conclusions: These results suggest that speckle-noise reduction enhances the detection of localized RNFL defects in patients with pre-perimetric glaucoma. Failure to detect the average of cpRNFL thickness within each sector may be a limitation for detecting pre-perimetric NFLDs.

P250 QUANTITATIVE ANALYSIS OF RETINAL NERVE FIBER LAYER THICKNESS IN HEALTHY KOREAN BY SPECTRALIS SD-OCT

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Background: To determine the normal range of retinal nerve fiber layer (RNFL) thickness in healthy Korean by SD-OCT and to discover the relationship of RNFL with age, gender, and variations of ocular parameters.

Methods: The peripapillary RNFL of randomly selected 218 eyes of 125 normal Korean (96 males and 122 females, age 20 to 76 years) was imaged with SD-OCT (Spectralis SD-OCT, Heidelberg Engineering). RNFL thickness was measured around the optic nerve head and divided into 4 segments. Refraction, axial length also measured using autorefractive keratometer, ultrasonography.

Results: The mean RNFL thickness of the normal Korean was $101.38 \pm 9.89 \mu\text{m}$. Considering RNFL thickness in 4 segments, the superior, inferior, nasal and temporal segment average thickness are $124.20 \pm 11.65 \mu\text{m}$, $129.5 \pm 10.18 \mu\text{m}$, $81.75 \pm 9.96 \mu\text{m}$, and $78.82 \pm 14.13 \mu\text{m}$. As age increased, mean RNFL thickness decreased significantly ($r = -0.169$, $p = 0.012$). Also RNFL thickness was observed to decrease with age in 3 quadrants except nasal area. : superior ($r = -0.332$, $p < 0.01$), inferior ($r = -0.371$, $p < 0.01$), temporal ($r = -0.251$, $p < 0.01$), nasal ($r = 0.008$, $p = 0.908$). Age-related RNFL values revealed significant negative correlation with axial length ($r = -0.569$, $p = 0.006$), refractive error ($r = 0.278$, $p < 0.01$). Disc cupping size had no significant influence in correlation analysis.

Conclusions: This study determined RNFL thickness, as

determined by Spectralis SD-OCT, for normal healthy Korean and age-related differences. The findings could be used as clinical parameters for early diagnosis of glaucoma.

P251 RETINAL NERVE FIBER LAYER IMAGING WITH SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY. AGREEMENT WITH OPTIC DISC PHOTOGRAPHY FOR MEASUREMENT OF RNFL DEFECTS

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Background: To compare the agreement of the area and the angular width of localized retinal nerve fiber layer (RNFL) defects measured with optic disc photography and optical coherence tomography (OCT).

Methods: 39 localized RNFL defects from 30 eyes of 22 glaucoma patients were identified from a database of 259 color optic disc stereophotographs. These patients had RNFL imaging performed with an SD-OCT. RNFL thickness deviation maps generated by the OCT with abnormal pixels denoted in red (RNFLT below the lower 99% normal distribution) or yellow (RNFLT below the lower 95% normal distribution) was aligned and overlaid with the corresponding optic disc photographs. The area and the angular width were measured and compared between optic disc photographs and the OCT RNFL thickness deviation maps. Their agreement was analyzed with the Bland-Altman plots.

Results: The area and the angular width of RNFL defects measured with the optic disc photographs were $2.45 \pm 1.04 \text{ mm}^2$ and $28.14 \pm 12.75^\circ$, respectively, which were significantly smaller than those measured by the OCT RNFL thickness deviation map when the RNFL defects were defined in yellow and red ($4.03 \pm 2.01 \text{ mm}^2$ and $75.91 \pm 45.57^\circ$, respectively, both with $p < 0.001$). When the RNFL defects were defined in red, a significant difference in angular width ($48.93 \pm 28.98^\circ$, $p = 0.004$), but not in area ($2.40 \pm 1.49 \text{ mm}^2$, $p = 0.443$) was found between the 2 imaging modalities. The agreement between OCT and optic disc photograph measurements of RNFL defects was poor. Larger RNFL defects were associated with greater differences between OCT and optic disc photograph measurements.

Conclusions: Analysis of the OCT RNFL thickness deviation map could reveal additional RNFL abnormalities not detectable in optic disc photographs.

P252 STRUCTURE-FUNCTION RELATIONSHIP OF MACULAR GANGLION CELL COMPLEX AND RETINAL NERVE FIBER LAYER MEASUREMENTS USING SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY IN GLAUCOMA

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Background: To measure macular ganglion cell complex (GCC) and retinal nerve fiber layer (RNFL) thickness with spectral-domain OCT (SD-OCT) in patients with glaucoma, and to evaluate and compare the correlation between visual field parameters and OCT measurements.

Methods: SD-OCT (RS3000, Nidek, Japan) was used to measure GCC, and circumpapillary RNFL thicknesses in

32 eyes from 16 glaucoma patients. All subjects underwent a full ophthalmic examination, including visual acuity, refraction, intraocular pressure measurement with Goldmann applanation tonometry, standard automated perimetry, and fundus examination. The diagnostic performance of the software-provided classification in both GCC and RNFL was evaluated on the correlation with visual field results in each hemi field. The associations between visual field mean deviation and OCT measurements were evaluated with regression analysis and Pearson correlation coefficients. A field defect was defined as having ≥ 3 significant ($p < 0.05$), non edge, contiguous points with ≥ 1 at the $p < 0.01$ level on the same side of horizontal meridian in the pattern deviation plot.

Results: In 64 hemifields tested, 41 (64.1 %) was classified as abnormal in both GCC and SAP, 6 (9.38 %) was classified as abnormal in GCC and was classified as normal in SAP, 2 (3.13 %) was classified as normal in GCC and was classified as abnormal in SAP, and 15 (23.4 %) was classified as normal in both GCC and SAP. 32 (50.0 %) was classified as abnormal in both RNFL and SAP, 3 (4.7 %) was classified as abnormal in RNFL and was classified as normal in SAP, 11 (17.2 %) was classified as normal in RNFL and was classified as abnormal in SAP, and 18 (28.1 %) was classified as normal in both RNFL and SAP. Mean GCC thickness was $73.22 \pm 11.13 \mu\text{m}$, and mean RNFL thickness was $74.94 \pm 9.82 \mu\text{m}$. The correlation (R^2) between visual field mean deviation and GCC thickness was 0.30 ($p = 0.0012$). In contrast, the correlation between visual field mean deviation and RNFL thickness was 0.25 ($p = 0.0038$).

Conclusions: Both macular GCC thickness and RNFL thickness showed significant correlation to the corresponding visual field sensitivity. The structure-function relationship was similar between GCC and RNFL measurements.

P253 HOW TO ASSESS SUPPOSED PERIMETRY RESULTS FROM SOCT READINGS IN GLAUCOMA PATIENTS

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When diagnosing or analyzing glaucoma advancement, we usually rely on both methods: objective analysis of the optic disc and retinal nerve fiber layer (RNFL) morphology, and subjective analysis of visual function (by means of perimetry). Unfortunately, in many cases we are not able to achieve reliable perimetry results. It happens in patients who have motorial or mental obstacle, as well as in those who have coexisting chorioretinal diseases. Diagnosing and assessing glaucoma advancement in such patients is of high difficulty. Aim of this study is to develop a method, which would allow to assess supposed perimeter results from SOCT readings, dedicated especially for this group of patients. There was a group of 47 patients (83 eyes) involved in this study. All of them were with diagnosed glaucoma (in various stages of advancement), no other eye diseases and reliable perimeter results. The perimeter was performed with Octopus 311, dynamic test G1. Optic disc and RNFL were analyzed with Spectral OCT Copernicus HR ver. 4.2 rev. 5. From the vast set of SOCT parameters, four well correlated with MD of static perimeter were taken for the further analysis. These were: a. Cup/Disc area ratio ($r = 0.71$) – b. Cup/Disc vertical diameter ($r = 0.67$) – c. RNFL mean thickness ($r = 0.67$) – d.

Rim absence ($r = 0.88$) where the linear Pearson correlation coefficient is denoted by r . On the basis of these four parameters, a new one called PCGA (Perimetry Correlated Glaucoma Advancement) was calculated, which was achieved by a linear scaling of the variability range for all four parameters to the variability range of the MD parameter. Then a weighted sum of scaled parameters was calculated with the weights given by the four individual correlation coefficients with MD. The resulting correlation coefficient of this new parameter with that of MD is approximately 0.78. In this way, we may obtain PCGA value, being supposed to be MD result in patients, where static perimeter is of no reliability. Sensitivity of this method is not perfect, but further study on a larger group of patients, seems to be necessary in order to improve results, i.e. to increase the correlation coefficient.

P254 GLAUCOMA DIAGNOSTIC CAPABILITIES OF OPTIC NERVE HEAD PARAMETERS AS DETERMINED BY CIRRUS™ HD OPTICAL COHERENCE TOMOGRAPHY

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Background/Purpose: To compare the glaucoma diagnostic capabilities of optic nerve head (ONH) parameters with retinal nerve fiber layer thickness (RNFLT) using Cirrus spectral-domain optical coherence tomography (OCT, Carl Zeiss Meditec Inc, Dublin, CA; version 5.0.0.326).

Methods: Two hundred and twenty nine glaucomatous, 405 glaucoma suspect, and 109 healthy subjects were imaged by Cirrus OCT optic disc cube mode. Correlations were sought between RNFLT and ONH parameters (disc and rim area, average and vertical cup to disc (C/D) ratio, and cup volume). Areas under receiver operating characteristic curves (AUCs) of average RNFLT were compared with those of ONH parameters with respect to discrimination between glaucomatous and healthy subjects. Subgroup analysis was performed in early (EG), moderate-to-advanced (AG) glaucomatous groups, glaucoma patients with a small disc area (SG) and a large disc area (LG).

Results: Rim area showed the strongest correlation with average RNFLT ($r = 0.663$) and the highest AUC (0.871). The overall AUC for discrimination between healthy and glaucomatous subjects was higher for average RNFLT than for rim area (0.957 vs 0.871, $p < 0.001$). In the EG and SG subgroup, the AUC of average RNFLT was significantly greater than those of all ONH parameters. In AG patients, the AUCs of average RNFLT and rim area, in LG patients, the AUC of average RNFLT and vertical C/D ratio, did not differ significantly.

Conclusions: RNFLT was better than any tested ONH parameter when used for glaucoma discrimination, especially in patients with early-stage glaucoma and in glaucomatous patients with small optic discs.

P255 COMPARISON OF SENSITIVITIES FOR DETECTING DIFFUSE AND LOCALIZED RETINAL NERVE FIBER LAYER DEFECTS WITH TIME-DOMAIN OPTICAL COHERENCE TOMOGRAPHY IN PATIENTS WITH GLAUCOMA

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Background: The thickness of retinal nerve fiber layer (RNFL) is decreased in a diffuse and/or a localized manner with glaucoma. The purpose of the present study was to compare the ability of time-domain optical coherence tomography (OCT) for detecting diffuse and localized RNFL defects using inbuilt normative database in patients with early to moderate open angle glaucoma.

Methods: This cross-sectional institutional study included 43 eyes of 43 subjects with diffuse RNFL defects and 89 eyes of 89 subjects with localized RNFL defects, both having localized visual field defects confined to one hemifield. Among 89 eyes with localized RNFL defects, 43 eyes of which mean deviation (MD) matched to that of 43 eyes with diffuse RNFL defects were selected for statistical analysis. The fast RNFL thickness protocol of the Stratus OCT (Carl Zeiss Meditec, Dublin, CA, USA) was used. The clock-hour sector and quadrant parameters corresponding to the hemifield with visual field defect were evaluated at $P < 0.05$ with regard to the integral normative database of Stratus OCT. The sensitivities of these parameters were compared between diffuse and localized RNFL defects.

Results: The average MD of glaucomatous eyes with diffuse RNFL defects (-2.63 ± 1.92 dB) was not significantly different compared with those with localized RNFL defects (-2.55 ± 2.05 dB) ($p = 0.86$). The sensitivity of clock-hour sector parameter in diffuse RNFL defects (83.7%) was not significantly different compared with that in localized RNFL defects (81.4%) ($p = 1.00$). The sensitivity of quadrant parameter in diffuse RNFL defects (74.4%) was significantly higher than in localized RNFL defects (51.2 %) ($p = 0.04$).

Conclusions: The clock-hour parameter of time-domain OCT detected RNFL defects without significant difference of sensitivities between diffuse and localized pattern of RNFL loss in glaucomatous eyes. However, the quadrant parameter of Stratus OCT showed better sensitivity in diffuse defect than in localized RNFL defects.

P256 GDX-VCC VS GDX-ECC IN GLAUCOMA DIAGNOSIS

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Background: To compare results provided by scanning laser polarimetry variable corneal compensation (VCC) vs enhanced corneal compensation (ECC) and evaluate correlation of visual field results in glaucoma patients.

Methods: Study included 339 eyes of 182 patients screened by the glaucoma unit of the University Eye Clinic of Pavia (Italy). Patients were submitted to complete ophthalmic examination, standard automated perimetry (SAP), scanning laser polarimetry with GDx-VCC and Gdx-ECC. We evaluated for each exam quality image Q, typical scan score (TSS), nerve fibers index (NFI), nerve fibers layer average thickness (TSNIT average), upper sector (TSNIT sup) and lower sector (TSNIT inf). Q, TSS and morphometric parameters VCC and ECC were compared using Wilcoxon signed-rank test and Lin correlation coefficient. Correlation between GDx and perimetric indexes MD and PSD were evaluated with Pearson correlation index 'r'.

Results: With VCC only 204 images on 339 images (60%) were good quality ($Q > 7$) meanwhile with ECC 325 on 339 (96%). With VCC 140 scanning on 339 (41%) had TSS < 80 meanwhile with ECC were atypical 20 scanning on 339 (6%). ECC vs VCC displays constantly lower TSNIT thickness and higher NFI. All comparison between ECC and VCC showed statistically significant differences. GDx parameters and perimetric indexes were compared with statistic significance. The correlation was better for ECC parameters and first of all NFI.

Conclusion: ECC provides better quality images vs VCC. High quality exam is the first condition to reproduce the real RNFL structure (more reliably). ECC notes nerve fibers layers significantly lower vs VCC and reveal a better correlation with perimetric indexes, is plausible GDx-ECC could improve early glaucoma diagnosis.

P257 RATE OF CHANGE OF RETINAL NERVE FIBER LAYER, NEURORETINAL RIM AND VISUAL FIELD PROGRESSION IN GLAUCOMA

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Background: Examination of serial stereo optic disc photographs is an important strategy to determine optic disc and RNFL progression in managing glaucoma. The agreement for assessment of progressive optic disc changes is poor even among glaucoma specialists. Major clinical trials evaluating glaucoma progression were essentially focused on visual field testing. There are relatively few published data on optic disc progression, and RNFL progression. The advent of digital imaging technologies has substantially enhanced objective and quantitative monitoring of RNFL changes. The RNFL is largely composed of axons of retinal ganglion cells whereas the neuroretinal rim also contains non-neural structures. Having a different structural composition, the longitudinal profile of progressive neuroretinal rim and RNFL damage is likely to be different. It is germane to know if the rate of progression is different between the two structural markers and to what extent they agree for detection of progression with visual field assessment. This study aims at evaluating the performance of progression detection and the rate of change of retinal nerve fiber layer (RNFL), neuroretinal rim and visual field measurements in glaucoma.

Methods: One hundred and eight eyes from 70 glaucoma patients were followed 4 monthly for at least 2.9 years (median 3.2 years) for measurement of RNFL thickness with the Stratus optical coherence tomography (OCT) (Carl Zeiss Meditec, Dublin, CA), neuroretinal rim area with the Heidelberg Retinal Tomograph (HRT 3, Heidelberg Engineering, GmbH, Dossenheim, Germany), and visual field with the Humphrey field analyzer II (Carl Zeiss Meditec). Linear regression analyses were performed between VFI (visual field index), RNFL, and neuroretinal rim measurements and age with progression defined when a significant negative trend was detected. The agreement among structural and functional measurements was evaluated with kappa statistics. The mean rate of change was estimated with linear mixed modeling.

Results: A total of 1105 OCT, 1062 HRT and 1099 visual field measurements were analyzed. The agreement of pro-

gression detection among the three investigations was poor ($\kappa \leq 0.09$). Ten eyes (9.3%)(9 patients) showed progression by average RNFL thickness, 16 (14.8%)(14 patients) by global neuroretinal rim area, and 35 (32.4%)(31 patients) by VFI. Only 1(0.9%) eye had progression detected by all 3 methods (Figure 1, 2 and 3). There were large variations in the rate of change of VFI, average RNFL thickness and global neuroretinal rim area with a range between -0.63% and -4.97% per year, -2.32 and -10.12% per year, and -0.61% and -8.48% per year, respectively (Table 1). The respective mean rate estimates were -1.15% per year (95% confidence interval: -1.56 to -0.73%), -0.70% per year (-1.19% to -0.21%), and -1.06% per year (-1.56% to -0.55%).

Conclusions: The agreement of progression detection among RNFL, neuroretinal rim and visual field measurements was poor and the rate of RNFL, neuroretinal rim and visual field progression varied considerably within- and between-subject. Given this variability, interpretation of RNFL, neuroretinal rim and VFI progression always should be evaluated on individual basis.

P258 COMPARISON OF RETINAL NERVE FIBER LAYER PROGRESSION BETWEEN SPECTRAL-DOMAIN OCT AND TIME-DOMAIN OCT

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Background: Based on the principle of low-coherence interferometry, both time domain and spectral domain optical coherence tomography (OCT) provide cross sectional visualization of the retina layers. Measurement of retinal nerve fiber layer (RNFL) thickness with OCT has been shown reliable to discriminate normal from glaucomatous eyes and detection of glaucoma progression. Spectral domain OCT allows more repeatable and reproducible than the time domain OCT. With a lower measurement variability, it is expected that the spectral domain OCT would be more sensitive to detect RNFL changes in glaucoma progression. The purpose of this study is to compare the performance of a spectral-domain OCT and a time-domain OCT to detect RNFL progression in glaucoma patients.

Methods: One hundred twenty-eight eyes from 81 glaucoma patients were followed at 4 month intervals for at least 24 months for RNFL imaging and visual field examination. Both eyes were imaged by the Cirrus HD-OCT (Carl Zeiss Meditec Inc., Dublin, CA) and the Stratus OCT (Carl Zeiss Meditec Inc.) and had visual field testing at the same visits. Linear regression analyses between circumpapillary RNFL measurements (average, superior and inferior RNFL thicknesses), visual field index (VFI) and follow-up time were performed. RNFL progression and RNFL improvement were identified when a significant negative or positive trend was detected, respectively. The agreement between the OCT instruments for progression detection was analyzed with kappa statistics.

Results: Twenty-two (19 patients) and 4 eyes (4 patients) had progression, and 0 and 5 eyes (5patients) had improvement detected by the Cirrus HD-OCT and the Stratus OCT average RNFL measurements, respectively (Fig.1). The agreement for detection of RNFL progression was poor between the 2 OCT instruments ($\kappa = 0.188, 0.027$ and 0.267 for average, superior and inferior RNFL thicknesses, respec-

tively). The respective agreement between VFI and average RNFL thickness progression determined by the Cirrus HD-OCT and the Stratus OCT was 0.125 and 0.047. The rate of average RNFL thickness progression ranged between -1.52µm/year and -5.03µm/year for the Cirrus HD-OCT and between -2.22µm/year and -7.60µm/year for the Stratus OCT (Fig. 2).

Conclusion: The Cirrus HD-OCT outperformed the Stratus OCT in detecting more eyes with RNFL progression and fewer eyes with RNFL improvement. Due to reduced measurement variability, the Cirrus HD-OCT could detect changes in RNFL thickness sooner than the Stratus OCT.

P259 CORRELATION BETWEEN STRUCTURAL AND FUNCTIONAL LOSS IN GLAUCOMA: GANGLION CELL LOSS VS FREQUENCY DOUBLING TECHNOLOGY

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Background: Glaucoma assessments have traditionally relied on visual field and optic disc measurements. Histological and theoretical considerations suggest that measuring ganglion cell structure and/or function might provide valuable adjuncts. Spectral Domain Optical Coherence Tomography (SD-OCT) enables measurement of ganglion cell density. Visual field testing by Frequency Doubling Technology (FDT) is believed to assess ganglion cell function. The aim of this study was to measure correlations between these two modalities.

Methods: We reviewed the case notes of 63 eyes of 31 patients. Ganglion cell indices by SD-OCT included average ganglion cell volume (GCC-av), generalised loss of volume (GCC-GLV), focal loss of volume (GCC-FLV) and difference in superior-inferior volume (GCC-SI). FDT indices included mean and pattern standard deviation (FDT-MD and FDT-PSD).

Results: All data were normally distributed (Kolmogorov-Smirnov Goodness to Fit: all tests $p > 0.05$). Correlations were tested by Linear Regression with Pearson Product Moment statistics. All ganglion cell indices correlated significantly with FDT-MD (GCC-GCC-av $R = 0.430$, $R^2 = 0.185$, $p < 0.001$; GCC-SI $R = -0.279$, $R^2 = 0.078$, $p < 0.02$; GCC-FLV $R = -0.508$, $R^2 = 0.258$, $p < 0.001$; GCC-GLV $R = -0.606$, $R^2 = 0.367$, $p < 0.001$) and with FDT-PSD (GCC-av $R = -0.381$, $R^2 = 0.145$, $p < 0.001$; GCC-SI $R = 0.420$, $R^2 = 0.176$, $p < 0.001$; GCC-FLV $R = 0.536$, $R^2 = 0.287$, $p < 0.001$; GCC-GLV $R = 0.465$, $R^2 = 0.216$, $p < 0.001$). The global ganglion cell loss index, GCC-GLV, was the strongest predictor of the index of total functional loss, FDT-MD, explaining 37% of the variance. Conversely, the focal ganglion cell loss index GCC-FLV proved to be the strongest predictor of focal functional loss, FDT-PSD, explaining 29% of the variance.

Conclusions: This preliminary study demonstrates significant correlations between structural and functional measures of ganglion cell loss. The strongest predictors, however, failed to explain levels of variance of functional loss that would suggest a role in current clinical practice. Histological evidence demonstrates that structural damage, especially ganglion cell loss, precedes functional changes. This might explain why Ganglion Cell indices, despite significant correlations, explain only a limited amount of the variance of

FDT performance. Ganglion cell measurements may well prove useful in the early diagnosis of glaucoma and especially pre-perimetric diagnosis. They may also have a useful role as an objective measure of glaucoma progression. We are currently investigating these roles.

P260 ABSTRACT WITHDRAWN

P261 CAN RETINAL NERVE FIBER LAYER THICKNESS PREDICT THE VISUAL OUTCOME AFTER DECOMPRESSION IN PATIENTS WITH PITUITARY ADENOMA?

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Purpose: To define the prognostic criteria for visual field recovery in patients with compressive optic neuropathy and consecutive visual field defect before decompression surgery by objective evaluation of retinal nerve fiber layer thickness (RNFLT) measured by optical coherence tomography (StratusOCT) and assessment of functional defect by standard automated perimetry (SAP).

Methods: Prospective cohort study including 46 eyes of 23 pituitary adenoma patients who underwent surgical intervention due to compressive macroadenoma. For comparison the study included 24 eyes of 12 patients with microadenoma, defined as negative controls for the disease. Any other optic neuropathy and retinal disease were excluded. In cases of surgical intervention RNFLT measurements and SAP were done one week before and one week, one month and three months after the surgery. One-way ANOVA with Tukey or Games-Howell post hoc tests, Pearson correlation and positive predictive value at various RNFLT thresholds were determined. SPSS 16.0 statistical software, accepting values of $p < 0.05$ as statistically significant were used for analysis.

Results: Based on post-surgical VF recovery of 46 eyes of 23 patients the baseline average (AVG0) RNFLT were $90.4 \pm 13.3 \mu\text{m}$ in those with total VF recovery ($n = 22$), but $75.8 \pm 13.3 \mu\text{m}$ when permanent visual loss was present ($n = 19$) and $96.5 \pm 8.2 \mu\text{m}$ in controls. AVG0 and the follow-up (AVG3) RNFLT were in good correlation with the final visual field parameters in the visually impaired (AVG0 vs MD = 0.947 and PSD = -0.969 ; AVG3 vs MD = 0.800 and PSD = -0.690). The positive predictive value of RNFLT at $70.0 \mu\text{m}$ was 1.0 , while at $80.0 \mu\text{m}$ it was 0.92 .

Conclusions: RNFLT imaging by means of OCT at baseline of patients with pituitary adenoma provides valuable information about the extent of the optic nerve damage. The possible nerve fiber loss detectable at the level of the retina in cases with successive visual field damage is a sensitive surrogate to forecast postoperative visual recovery.

P262 AGREEMENT BETWEEN VISUAL FIELD GLOBAL INDICES AND RETINAL NERVE FIBER LAYER THICKNESS AS MEASURED BY SCANNING LASER POLARIMETRY WITH ENHANCE CORNEAL COMPENSATION AND OPTICAL COHERENCE TOMOGRAPHY

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Objective: To assess the strength of the association between retinal nerve fiber layer (RNFL) thickness measured with scanning laser polarimetry (GDx ECC) and optical coherence tomography (OCT), and visual field (VF) global indices (MD, PSD, and VFI) in patients with glaucoma and healthy subjects.

Methods: One hundred eleven subjects, 64 normal 36 with early to moderate open-angle glaucoma (OAG) who met the eligibility criteria were enrolled in this prospective, cross-sectional, and observational study. Subjects underwent complete ophthalmologic examination, automated perimetry, GDx-ECC and HD-OCT. GDx-ECC parameters were recalculated in 90 degrees segments (quadrants) in the calculation circle to be compared. The relationship between RNFL thickness and VF, expressed as MD, PSD, and VFI, were evaluated with Pearson correlation coefficients and Lin's concordance coefficients. P-values less than 0.05 were considered statistically significant.

Results: Correlation of RNFL and the VF parameters MD, PSD, and VFI in normal eyes was not significant. Correlation coefficients (r) between RNFL and VF parameters in glaucoma eyes were moderate and statistically significant: ranged from 0.51 (VFI) to -0.53 (PSD) for AvgThick OCT, from -0.57 (PSD) to 0.66 (MD) for TSNIT ECC; and from -0.60 (MD) to -0.63 (VFI) for NFI ECC. Concordance (r_c) of RNFL and the VF parameters were low in normal and glaucoma eyes.

Conclusion: The results of our study suggested that structure-function relationship in glaucoma evaluated with a correlation test, as an index of the precision of the data, is statistically significant but moderate. However, agreement between structure and function evaluated by a concordance test, as a measurement of the accuracy of the data, is poor.

P263 FAST VS. EXTENDED SCANNING LASER POLARIMETRY PROGRESSION ANALYSIS

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Purpose: Ocular imaging devices provide quantitative structural assessment that might improve glaucoma progression detection. The best way of using this information to detect progression remains unknown. Scanning laser polarimetry (SLP) offers progression analysis based on population-derived cut-off criteria (Fast) and analysis based on individual-derived criteria (Extended). The purpose of this study was to compare the performance of SLP Fast and Extended progression analysis.

Methods: Healthy, glaucoma suspect, and glaucomatous eyes (76 eyes of 48 subjects) with at least 4 reliable visual fields (VF) and good quality scanning laser polarimetry (GDx-ECC) acquired at the same visits were enrolled. VF progression was defined by the guided progression analysis (GPA) and by the visual field index (VFI). GDx measurements were analyzed by the fast mode (FM) using a single measurement from each visit that was compared to the population rate of progression, and the extended mode (EM) using 3 sequential measurements from each visit that were compared to individual variability.

Results: Average baseline VF mean deviation was -1.34

(range: -10.85 to 2.07) dB and average follow-up duration was 3.3 (1.6-5.1) years. Using the GDx summary plot report, 12 eyes progressed with EM, 11 with FM, with 6 of the eyes progressing by both methods. Seven eyes progressed by VF but only 2 of them were defined as progressors with EM with one of these eyes progressing also by FM. Using TSNIT average report, 6 eyes progressed by EM and 10 by FM. None of the TSNIT EM progressors showed progression with VF. Two FM progressors were also progressing by EM and 2 other eyes progressed by VF.

Discussion: There is poor agreement between VF and GDx progression regardless of the use of population derived or individual variability criteria. Further investigation is needed to determine the best method to assess glaucoma progression.

P264 PECULIARITY OF OPTIC NERVE HEAD MORPHOMETRY IN GLAUCOMA AND AGE-RELATED MACULAR DEGENERATION

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Background: To study peculiarities of changes of optic nerve head measurements in patients with normal-tension glaucoma and age-related glaucoma.

Material and Methods: 23 patients (40 eyes) with late atrophic AMD and 22 patients (38 eyes) with normal-tension glaucoma in developed and advanced stages were examined. Morphometry of optic disc head was performed using optical coherent tomography on Stratus OCT 3000.

Results: Tendency to increased area of optic disc head was noted in late AMD group. Disc area of 2.5 – 3.0 mm² was found in 11 eyes (27, 5%), shape of optic nerve head was regular. In patients with normal-tension glaucoma at developed and advanced stages the same tendency to increased optic disc head area was noted. Disc area of 2.5-3.0 mm² was found in 20 eyes (52.6%). Cup/disc ratio in patients with AMD in 50 % of cases (20 eyes) was 0.791 ± 0.06, moderate in deepness; in patients with normal-tension glaucoma 0.864 ± 0.07, moderate in deepness. In group with AMD there was moderate decrease of volume (0.337 ± 0.01) and area of neural rim (1.46 ± 0.06). In group with normal-tension glaucoma there was significant decrease of volume (0.141 ± 0.02) and area of neural rim (1.076 ± 0.06). RNFL in AMD patients was moderately diminished in all segments (96.2 ± 2.8 μm), in normal-tension glaucoma patients it diminished in temporal segment (79 ± 3.5 μm).

Conclusion: Peculiarity of optic disc head morphometry in patients with AMD in moderate diminished volume and area of neural rim and evenly moderately decreased RNFL in all segments. In patients with normal-tension glaucoma volume and area of neural rim was significantly decreased and specific thinning of RNFL in temporal segment of optic disc was noted.

P265 ASSESSMENT OF MACULAR ANATOMICAL AND FUNCTIONAL CHANGES IN GLAUCOMA PATIENTS

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Background: Glaucoma is recognized to have its major detrimental effect upon the eye by killing retinal ganglion cells. The process of cell death appears to be initiated at the optic nerve head, though other sites of injury are possible but unconfirmed. There is a greater loss of ganglion cells from some areas of the eye, and this feature of glaucoma seems related to the regional structure of the supporting connective tissues of the optic nerve head. To detect the correlation between micro-structural changes in the Ganglion Cell Complex (GCC) thickness and macular functional damage detected in glaucoma patients.

Methods: A prospective study on patients with primary open-angle glaucoma (POAG). The patients were divided into groups according to the generalized glaucoma functional damage detected, Evaluation of micro-structural changes of the Ganglion Cell Complex (GCC) at the macular area using spectral domain optical coherence tomography (OCT) was performed. Deviation map together with the average, superior and inferior GCC thicknesses obtained from the thickness map were used. Humphrey Automated Perimetry (HAP) using 10-2 Threshold strategy for detection of functional damage at the macular area was also performed to all eyes

Results: Significant correlation between anatomical and functional changes in glaucomatous maculae with significant deviation from normal values was detected in eyes with severe affection. An Average thickness of the GCC in eyes showing no visual field defect was $\pm 102.1 \mu$. In eyes with early glaucomatous functional damage the average GCC thickness was $\pm 96.5 \mu$, while eyes showing advanced field defects had an average GCC thickness of $\pm 65.2 \mu$. These changes indicated a significant reduction of the GCC thickness (deviations exceeding the lower 95th percentile), compared to age-matched normative database, in patients with advanced glaucomatous functional damage. A statistically significant correlation between the GCC thickness and the existing macular field defects was detected in the inter-group analysis.

Conclusion: The combination of evaluating the macular area both anatomically (using spectral domain OCT) and functionally (using the HAP, 10-2 strategy) has an important role in defining the impact of GCC thickness on the integrity of the visual function in glaucoma patients.

P266 COMPARISON OF OPTIC NERVE HEAD CONFIGURATION BETWEEN NORMAL-TENSION GLAUCOMA AND PRIMARY OPEN-ANGLE GLAUCOMA BY HEIDELBERG RETINA TOMOGRAPH III

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Background: HRT III can measure automatically three dimensional topography images of optic disc and surrounding retina using five parameters of glaucoma probability score (GPS). We analysis the difference of optic nerve head topography between normal-tension glaucoma and primary open-angle glaucoma with HRT III.

Methods: Seventy-five normal-tension glaucoma patients and 80 primary open-angle glaucoma patients were included. Five parameters of GPS, rim steepness, cup size, cup depth, horizontal RNFL curvature and vertical RNFL curvature were compared between two groups.

Results: Among five parameters, rim steepness has statisti-

cal significant difference ($p < 0.05$) between two groups, and cup size and vertical RNFL curvature has the difference but no statistical significance. Rim steepness also has significant difference after correcting the difference of MD and PSD in visual field between two groups.

Conclusion: There are controversy whether optic nerve head topography is different between normal-tension glaucoma and primary open-angle glaucoma or not. In this study, with the measurement of HRT III, rim steepness has statistical significant difference between normal-tension glaucoma and primary open-angle glaucoma.

P267 EFFECT OF MACULAR NERVE FIBER LAYER MEASUREMENTS SUPERIOR AND INFERIOR SEPARATELY ON DETECTING GLAUCOMATOUS VISUAL FIELD DEFECTS

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Background: Our purpose is to evaluate the effectiveness of ganglion cell (GCC) parameters (GCC average, GCC superior, GCC inferior, FLV, GLV,) obtained by GCC measurement using Fourier-domain OCT (RTVue-100) to find out the glaucomatous visual field changes.

Methods: Compare the discrimination power of GCC average, GCC superior, GCC inferior, FLV and GLV to detect glaucoma at early, moderate and severe stage. Participant underwent reliable standard automated perimetry testing and OCT imaging with GCC scan. The area under the receiver operating characteristic curve (AUC) was used to discriminate the power of GCC average, GCC superior, GCC inferior, FLV and GLV to detect glaucoma at early, moderate and severe stage.

Results: One hundred fifty glaucoma patients and 73 normal subjects were included in this study.

The AUC for GCC average were 0.758, 0.815, 0.921; GCC superior were 0.977, 0.976, 0.987; GCC inferior were 0.93, 0.971, 0.976; FLV were 0.775, 0.887, 0.973 and GLV were 0.768, 0.836, and 0.952 for early, moderate and severe glaucoma respectively. Among those parameters, GCC superior had the highest AUC for detecting each stage of glaucoma.

Conclusion: Ganglion cell complex parameter divided into superior and inferior can detect the corresponding visual field loss caused by glaucoma with high discrimination power. The AUC was higher with the severity of glaucoma stage.

P268 INVESTIGATION OF FLOOR EFFECT FOR RETINAL NERVE FIBER LAYER MEASUREMENT WITH OPTICAL COHERENCE TOMOGRAPHY

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Background: Optical coherence tomography (OCT) average retinal nerve fiber layer (RNFL) thickness does not get below 30 μ m even in eyes with optic neuropathy with no light perception. However, it is unknown what factors contribute to this 'floor effect'. We examined the effect of retinal blood vessels (BV) and the frequency of segmentation failure on RNFL measurement obtained with a spectral-domain OCT.

Methods: One hundred and thirty glaucoma patients, forty

suspects and forty normal subjects were enrolled for this study. One eye was selected at random from each subject for circumpapillary RNFL scan by the Spectralis OCT (Heidelberg Engineering, GmbH, Dossenheim, Germany). The OCT images were exported to a customized computer program written in MATLAB R2010a (The MathWorks Inc., Natick, Massachusetts, USA) to remove BVs and refine the boundaries of RNFL. The effect of BVs removal and RNFL segmentation refinement to RNFL measurement were evaluated.

Results: The mean proportion of BVs relative to the average RNFL thickness was $4.2 \pm 0.9\%$, $4.7 \pm 1.5\%$ and $7.8 \pm 4.7\%$, respectively for the normal, suspect and glaucoma groups. When the average RNFL thickness was above approximately $70\mu\text{m}$, the proportion remained at 4.5% (95% CI: $4.2 - 4.8$). When it is below $70\mu\text{m}$, the proportion increased with decreasing RNFL thickness. Taking the refined RNFL thickness as the reference standard, 7.50% had an underestimate (average RNFL thickness (post-refinement) – average RNFL thickness (pre-refinement) $> 3.5\mu\text{m}$) in the suspect group, 6.15% had an overestimate (average RNFL thickness (pre-refinement) – average RNFL thickness (post-refinement) $> 3.5\mu\text{m}$), and 4.62% had an underestimate in the glaucoma group. For eyes with an overestimate, the algorithm misidentified the outer boundary of the ganglion cell layer as that of the RNFL (Fig. 1A). For eyes with an underestimate, the algorithm failed to detect the segment with thin RNFL (Fig. 1B).

Conclusions: Both the inclusion of BVs and segmentation failure could contribute to floor effect of OCT RNFL measurement. The impact of BVs on RNFL measurement is more substantive in advanced glaucoma when the RNFL is thin. Enhancement of RNFL segmentation algorithm with removal of BVs may improve the detection of progressive RNFL changes.

P269 EFFECT OF GLAUCOMA SURGERY ON RETINAL NERVE FIBER LAYER THICKNESS AND OPTIC NERVE HEAD PARAMETERS USING STRATUS OCT

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Background: Retinal nerve fiber layer (RNFL) thickness measurement by optical coherence tomography (OCT) is a useful adjunct in glaucoma management especially for monitoring progression. However, it may alter after lowering intraocular pressure (IOP) with drugs or surgery. It is uncertain whether the change in RNFL thickness is transitory or persistent with mixed results from different studies. There have also been reports of changes in optic nerve head (ONH) parameters measured by confocal scanning laser ophthalmoscopy (CSLO) following lowering of IOP but these changes using the OCT have not been studied. This study was done to evaluate changes in RNFL thickness and ONH parameters measured by Stratus OCT before and after trabeculectomy.

Methods: This prospective interventional case series included seventeen patients scheduled for trabeculectomy. Thirteen patients were male and four were females with a mean age of 51.23 ± 7.15 years. There were 8 primary open-angle glaucoma, 6 primary angle-closure glaucoma and 3 secondary open-angle glaucoma patients. RNFL and ONH

parameters were measured using Stratus OCT version 3 (Carl Zeiss Meditec, Dublin, CA) 1 week preoperatively and at 1 week, 1 month and 3 months post trabeculectomy. The change in best corrected visual acuity (BCVA), IOP, average and quadrant RNFL thickness vertical integrated rim area, horizontal integrated rim width, disc area, cup area and rim area following trabeculectomy were noted.

Results: The BCVA was $> 20/40$ in 11 patients preoperatively and in 7, 11 and 14 patients at 1 week, 1 month and 3 months respectively after surgery. The mean IOP was 30.23 ± 9.02 mmHg preoperatively. It reduced by 68.5% at 1 week (9.52 ± 2.42 mmHg), 59.1% at 1 month (12.35 ± 4.59 mmHg) and 53.9% at 3 months (13.6 ± 2.31 mmHg) postoperatively. The mean average RNFL thickness preoperatively was $54.05 \pm 14.02\mu\text{m}$, which changed to $59.39 \pm 19.52\mu\text{m}$, $54.50 \pm 10.17\mu\text{m}$ and $51.95 \pm 11.94\mu\text{m}$ at 1 week, 1 month and 3 months postoperatively. The average RNFL thickness increased significantly by $5.33 \pm 8.44\mu\text{m}$ at 1 week ($p = 0.019$) but the change at 1 month ($0.44 \pm 6.37\mu\text{m}$) and 3 months ($2.10 \pm 7.49\mu\text{m}$) was not statistically significant. Amongst the ONH parameters, the optic disc cup area showed a statistically significant decrease from 2.39 ± 0.52 mm² preoperatively to 2.14 ± 0.52 mm² at 1 week ($p = 0.022$) and 2.22 ± 0.53 mm² at 1 month ($p = 0.038$). However, the cup area measurement of 2.25 ± 0.59 mm² at 3 months was not significantly lesser than the preoperative value ($p = 0.214$). No significant change was found in other ONH parameters. There was no correlation between change in average RNFL thickness parameters and IOP change at 1 week ($p = 0.73$), 1 month ($p = 0.93$) and 3 months ($p = 0.11$). The cup area and IOP change at 1 week ($r = -0.26$, $p = 0.31$), 1 month ($r = -0.027$, $p = 0.27$) and 3 months ($r = -0.55$, $p = 0.20$) also showed no correlation.

Conclusions: Short term fluctuations were noted in RNFL thickness and ONH parameters postoperatively following trabeculectomy but the values reverted back to normal within 3 months. This may be an artifactual change due to post-operative edema. Our study showed that this transient increase should not be considered and preoperative measurements should be taken as baseline for follow up.

P270 ANALYSIS OF RETINAL NERVE FIBER LAYER (RNFL) DEFECTS IN GLAUCOMA PROGRESSION

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Background: Progressive RNFL thinning is commonly evaluated with trend or event analysis on global or sectorial RNFL thicknesses derived from a circumpapillary scan. With the advent of spectral-domain optical coherence tomography, evaluation of RNFL defects can be examined in an RNFL thickness map. The purpose of this study was to develop an algorithm to identify the longitudinal changes of RNFL defects based on the RNFL thickness deviation map derived from the Cirrus HD-OCT.

Methods: The RNFL thickness deviation map was composed of 50×50 pixels. RNFL measurement below the 95% normal distribution range in each pixel was highlighted in the RNFL thickness deviation map and color-coded based on the probability of normality. RNFL defects were defined as RNFL measurements fell outside the lower 99% of the centile ranges and coded in red. A software program written in MAT-

LAB 2010a was developed to identify new changes in the RNFL thickness deviation map. Three baseline and 2 follow-up images for each eye were examined. The baseline images were overlaid by matching the branch points of retinal blood vessels. Repeatable RNFL abnormalities coded in red in the baseline images were compared with the 2 follow-up images to look for development of new RNFL defects. Serial OCT images from 10 eyes of 10 glaucoma patients followed every 4 months for 30 months were evaluated.

Results: Two patterns of progressive changes of RNFL defects were identified: (1) new islands of RNFL defects (14%) and (2) expansion of a pre-existing defect (86%). RNFL defects expansion was more commonly found over the temporal edge (74%) than the nasal edge (26%) of the defects. Progressive RNFL defects developed in a range between 0.41 mm² and 1.54 mm² and were largely found over the superotemporal, followed by the inferotemporal sectors of the optic disc.

Conclusion: This study illustrated the methodology of evaluating longitudinal changes of RNFL defects using the RNFL thickness deviation map. Prospective studies with a larger sample size are needed to investigate the patterns and risk factors of RNFL defects expansion in glaucoma patients.

P271 ANALYSIS OF RETINAL NERVE FIBER LAYER THICKNESS IN ALCOHOL-INDUCED OPTIC NEUROPATHY

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Purposes: To evaluate the retinal nerve fiber layer (RNFL) thickness using Optical Coherence Tomography (OCT) in chronic alcohol users.

Methods: We studied seventeen chronic alcohol users. In a control group, sixteen volunteers without use of alcohol. Subjects had similar characteristics ages 35-45, and normal vision. Both eyes were tested for analysis of the retinal nerve fiber layer thickness with Stratus OCT.

Results: There was alteration in the Deviation from normal graph with a loss of nerve fibers in 39.4% of patients in the study group. In the control group this alteration was observed in 14 eyes (18.7%). As regards the parameters that allow comparison between the study and control groups Stratus OCT was able to detect RNFL loss in the papillomacular bundle of patients with alcohol induced optic neuropathy.

Conclusions: The chronic use of alcohol was associated with alteration of the nerve fiber layer. Stratus OCT is capable of identifying RNFL loss in the papillomacular bundle of patients with late stage alcohol induced optic neuropathy. Thus, these results can contribute to the early diagnosis of nerve fiber layer loss in optic neuropathy.

P272 SPECTRAL DOMAIN OCT ANALYSIS OF NERVE FIBER AND GANGLION CELL COMPLEX THICKNESS IN PRE-PERIMETRIC GLAUCOMA

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Introduction: Pre-perimetric glaucoma (PPG) may be defined as the presence on clinical examination of typical glaucomatous disk changes, focal or generalized rim thin-

ning, and abnormal excavation, with a normal computerized visual field.

Methods and Materials: 147 consecutive patients with glaucoma or suspicion of glaucoma were examined by the Optovue SD OCT. After complete ophthalmic examination including Humphrey 24-2 visual field testing. 30 patients (19 female, 11 male; mean age 63.7 years) were identified with perimetric glaucoma (PG) in one eye and PPG in the fellow eye. The 30 eyes with PPG were compared to 47 randomly chosen eyes of 47 normal patients (28 female, 19 male; mean age 60 years). The following OCT parameters were studied: total, superior, and inferior retinal nerve fiber layer (RNFL) thickness; total, superior, and inferior ganglion cell complex (GCC) thickness; focal loss volume (FLV) and global loss volume (GLV). In addition, mean deviation (MD) and pattern standard deviation (PSD) visual field indices were compared. Normal distribution was verified with the Kolmogorov-Smirnov test. For normal distributions, means were compared between the two groups with the t-test, whereas the Mann-Whitney U test was used to compare the medians of the non-normal distributions.

Results: Significant differences in average, superior, and inferior RNFL were found (mean ± SEM): PPG: 91 ± 2.3 µ, 91 ± 2.5 µ, 92 ± 2.5 µ – Normals: 101 ± 1.8 µ, 100 ± 1.9 µ, 102 ± 1.8 µ p = 0.001, 0.002, 0.001 by t-test. The FLV index was also significantly different (Median, first-third quartiles): PPG: 1.52 (0.6 – 3.72) – Normals: 0.50 (0.26 – 1.06) p < 0.001 (Mann-Whitney U test). Areas under the ROC all showed relatively low sensitivity and specificity: Av RNFL 0.713, sup RNFL 0.710, inf RNFL 0.699, total GCC 0.635, sup GCC 0.629, inf GCC 0.626, FLV 0.746, GLV 0.670, MD 0.657, PSD 0.682.

Conclusion: RNFL thinning and focal thinning of the GCC given by the FLV index relative to normals are characteristic of PPG, consistent with the idea that ganglion cell complex and nerve fiber pathology precede visual field defects. The AROC for FLV is the highest of the parameters studied, but judged only fair at best. RNFL thickness and FLV of the GCC are neither specific nor sensitive enough to be of isolated diagnostic value.

P273 COMPARISON OF RETINAL NERVE FIBER LAYER THICKNESS MEASUREMENTS USING STRATUS AND SPECTRALIS OPTICAL COHERENCE TOMOGRAPHY IN VARIOUS STAGES OF GLAUCOMA

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Background: To determine the agreement between the retinal nerve fiber layer (RNFL) thickness measurements from the Stratus Time domain Optical Coherence Tomography (OCT) and the Spectralis Spectral Domain OCT.

Methods: A total of 218 eyes from 171 normal subjects and subjects with glaucoma were analyzed. The subjects were divided into groups by visual field criteria: normal (n = 77), early glaucoma (n = 75), moderate glaucoma (n = 41) and severe glaucoma (n = 25). Peripapillary RNFL thickness were measured with the Stratus OCT and the Spectralis OCT on the same day in one eye of each subject to determine agreement. Two operators used the same instruments for all scans. Main outcome measures: Mann-Whitney U test and Bland-Altman analysis of the RNFL thickness measurements.

Results: The average age of glaucoma subjects was significantly higher than normal subjects: 61.34 ± 43.8 years versus 43.8 ± 17.03 years, respectively. For Stratus OCT the average RNFL values (Mean \pm Standard deviation) was $104.7 \pm 24.38 \mu$, $84.8 \pm 10.6 \mu$, $72.8 \pm 10.7 \mu$, $54.8 \pm 12.4 \mu$ in the normal, early, moderate and severe glaucoma groups, respectively. The corresponding values for the Spectralis were $100.6 \pm 18.8 \mu$, $82.7 \pm 9.2 \mu$, $72.3 \pm 8.9 \mu$ and $53.5 \pm 14.5 \mu$. The Stratus – Spectralis differences were not significant except in the normal group $p = 0.02$ (by Mann – Whitney test). Quadrant wise Bland- Altman plot analysis showed a systematic difference in measuring RNFL thickness between the 2 devices. Spectralis underestimates thinner RNFL and overestimates thicker RNFL compared to Stratus OCT.

Conclusion: Spectralis and Stratus RNFL thickness measurements cannot be used interchangeably. Spectralis measurements appear to be smaller at thinner RNFL and should be interpreted with caution in severe disease.

P274 CONTOUR LINE DRAWING ON THE HRT WITH AND WITHOUT THE HELP OF DISC PHOTOGRAPHS: CLINICAL IMPLICATIONS

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Background: There is no specific criteria for drawing the contour outline of the optic disc in the HRT III analyzer. The contour line either can be placed on the topography or on the reflectance image with or without the aid of a conventional optic disc photograph. Our goal is to determine whether statistically and clinically significant differences can be detected in the measured HRT III parameters between standard and photography-guided contour line drawing.

Methods: We analyzed twice, 51 HRT III images (v 3.0) for 51 eyes of patients with ocular hypertension and early glaucoma. The first results were obtained drawing the contour line based on topographic and reflectance maps. the contours are deleted at the end of the session. The second measures were done a week later by the same observer at the same images, and the contour line was determined based on monoscopic digital photographs from a non-mydratic retinal camera. We apply the intraclass correlation coefficient (ICC) test to assess the relationship between the two measurements, and record the change of clinical significance of MRA analysis of 306 papillary sectors studied and the 51 global analysis identified.

Results: The ICCs values were above 0.8 in all measured parameters except disc area (0.622), rim area (0.548) and FSM (0.596). Thirty-one of the fifty-one images analyzed, showed differences between both methods: 24 images showed worse results in the standard measurements and 7 showed worse results in photograph based measurements. 48 of the 305 papillary sector registered have a worse outcome in the analysis of the standard images and 10 papillary sectors are worse after using photographs to determine the contour line. A definitive diagnosis of MRA is worst in 10 images analyzed using HRT III maps, and one eye worsened his overall analysis on the photograph-based contour images.

Conclusions: HRT stereometric data do not differ significantly by drawing the outline with or without the aid of photography in patients with ocular hypertension or early glaucoma. However, there are significant changes in the MRA in 60% of eyes evaluated.

P275 COMPARISON OF DIAGNOSTIC CAPABILITY OF STRATUS AND SPECTRALIS OPTICAL COHERENCE TOMOGRAPHY IN PATIENTS WITH GLAUCOMA

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Background: To compare the diagnostic agreement and performance for glaucoma detection between a time-domain (Stratus) and a spectral-domain (Spectralis) optical coherence tomograph (OCT).

Patients and Methods: 60 primary open-angle glaucoma, 60 ocular hypertension and 60 normal subjects were included in this study. One eye from each individual was selected randomly for retinal nerve fiber layer (RNFL) imaging by the Stratus (Carl Zeiss Meditec Inc., Dublin, CA,) and the Spectralis OCT (Heidelberg Engineering), respectively. Glaucoma was defined based on the presence of visual field defects with the Humphrey visual field analyzer (Carl Zeiss Meditec, Dublin, CA). Measurements were performed in two different sessions on the same day with each of the systems. The measurements of retinal nerve fiber layer (RNFL) thickness were compared among the groups. Areas under the receiver operating characteristics curves (AUCs), including the average thickness, thickness in each of the 4 quadrants, were compared.

Results: RNFL thicknesses of the two OCTs showed a good correlation. The mean the average thickness, and thickness in each of the 4 quadrants in glaucomatous eyes significantly less than in normal and OHT eyes determined by the 2 OCT devices. The AUCs for the RNFL thickness parameters of Stratus OCT were similar to that of Spectralis OCT.

Conclusions: Both OCT technologies did well in the diagnosis of glaucoma. RNFL thickness parameters are able to discriminate between normal, ocular hypertensive patients and glaucoma.

P276 RELATIONSHIP OF GLAUCOMATOUS CHANGE IN PERIPAPILLARY RNFL AND MACULAR THICKNESS OBSERVED BY SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY

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Purpose: To determine the difference between peripapillary retinal nerve fiber layer (RNFL) thickness and macular thickness measurements by Spectralis domain optical coherence tomography (SD-OCT) in normal subjects and glaucoma patients.

Design: Evaluation of diagnostic test for better screening or early diagnosis. **Participants:** A total of 81 eyes from 50 subjects (male = 53%, female = 38%, average age of 56.01 yrs old) were included. The subjects consist of three groups: normal (n = 35), mild to moderate glaucoma (n = 20), and severe glaucoma (n = 26).

Methods: Peripapillary RNFL and macular thickness was measured with SD-OCT. Two operators used the same instruments for all scans on the same day for each subject.

Main Outcome Measures: Student paired t testing, kolmogorov, reduction ratios, and ROC curve analysis of RNFL and macular fiber thickness measurements was used.

Results: The average age of the glaucoma groups were

slightly more than that of the normal group: 53.49 versus 57.93 years, respectively. The average RNFL thickness (mean \pm standard deviation) was $95.14 \pm 8.6 \mu\text{m}$, $71.70 \pm 12.9 \mu\text{m}$ and $45.38 \pm 8.7 \mu\text{m}$ for the normal, mild to moderate, and severe groups, respectively. For average macular thickness the corresponding measurements were $313.0 \pm 9.9 \mu\text{m}$, $303 \pm 16.7 \mu\text{m}$, and $280.07 \pm 16.2 \mu\text{m}$. All differences were statistically significant by t testing ($p < 0.001$). There was also a highly significant direct linear relationship between macular fiber thickness and RNFL thickness ($p < 0.001$). ROC curve plots showed larger values in nasal outer area (.833), inferior outer (.832) and superior outer (.818). However, the same measurement for RNFL revealed bigger numbers in superior (.972) and inferior (.946) regions, according to findings these areas are more sensitive to pressure change and can be better representatives of disease progression.

Conclusion: correlation among peripapillary RNFL and macular thickness measurements demonstrate a parallel changes in both regions while higher correlation is observed in outer ring of macula thickness with more sensitivity in nasal, inferior and superior regions, respectively.

P277 ABSTRACT WITHDRAWN

P278 NORMATIVE VALUES WITH SPECTRAL-DOMAIN OPTICAL COHERENCY TOMOGRAPHY (CIRRUS OCT) FOR EVALUATED RETINAL NERVE FIBER LAYER (RNFL) THICKNESS IN COLOMBIAN POPULATION

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Objectives: To describe the global values, by quadrant and segment of retinal nerve fiber layer (RNFL) measurement with Spectral-Domain optical coherence tomography (Cirrus OCT) in Colombian population.

Design: Transversal descriptive-prospective.

Patients and Methods: 211 eyes out of 120 healthy patients were examined. Thorough ophthalmological examination was conducted by a glaucoma specialist, Humphrey computerized visual campimetry and Spectral-Domain optical coherence tomography (Cirrus OCT, Carl Zeiss Meditec, Optic Disk Cube protocol 200 x 200).

Results: The average age of the participants was 40.35 ± 13.2 years (range between 18 and 69 years of age), with a female participation of 59%. The average CFNR global peripapillary thickness was $98.5 \pm 9.28 \mu\text{m}$ with a range between 74 and $124 \mu\text{m}$. Quadrant value results were the following: upper $123.2 \pm 16.82 \mu\text{m}$, nasal $71.4 \pm 11.5 \mu\text{m}$, lower $131.5 \pm 15.95 \mu\text{m}$ and temporal $67.2 \pm 9.42 \mu\text{m}$. There was evidence of less thickness in patients above 60 years of age and slightly thicker in females. The thinner segments are numbers 3 and 9; the thicker segments are number 6 and 7.

Conclusions: The global average of thickness of CFNR was slightly higher than the one reported by other studies conducted on races other than Hispanic using the same technology, and lower than the ones conducted on populations with similar OCT Time-domain.

Key Words: Optical coherence tomography, Retinal nervous fiber layer, Time-domain, Spectral-domain.

P279 TEST RETEST VARIABILITY OF SPECTRAL-DOMAIN OCT IN ASSESSMENT OF RETINAL NERVE FIBER LAYER FOR PATIENTS HAVING GLAUCOMA

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Background: Spectral-Domain OCT is an objective test to assess RNFL thickness in Patients having Glaucoma. Interpretation of results is based on measured thickness of RNFL by machine; however measured RNFL thickness may varies between the test and influence results. To assess inter test or test retest measurement variability with the Spectral-Domain optical coherence tomography (OCT) in diagnosing retinal nerve fiber layer defects in patients having Glaucoma.

Methods: In a prospective analysis of consecutive Three hundred twenty eyes of patients having Glaucoma underwent spectral-Domain OCT (Cirrus, Carl Zeiss Mediate Inc Dublin, CA). For every patient at least three RNFL images were taken, 6x6-mm square parapapillary region scans were done fifteen minutes apart, and best of two scans were selected for comparison. All test reports included in study pass the signal strength (more than six), artifacts free good images only considered for evaluation. In all patients RNFL thickness compared on average RNFL thickness, thickness in each quadrants and at each clock hours. Intertest variability is considered significant if RNFL thickness deviation map showing deviation of probability from 95% to 5%, or 5% to 1% (color code map shows green to yellow or green/ yellow to red) in at least one clock hour angular location. In all these patients who showed deviation in at least one clock hour position RNFL thickness also compared in each quadrant. At each clock hour where RNFL thickness variation was noted on color coded map, mean of RNFL thickness variation was calculated and compared with mean of RNFL thickness of each patients at one of the clock hour position where no deviation was seen.

Results: Twenty one eyes (6.56%) shows deviation of RNFL thickness as green to yellow or green / yellow to red at least in one of the clock hour position, however on analysis of four quadrants only seven eyes (2.18%) shows similar kind of deviation between two test results. In all the patients average RNFL color coding remained unchanged. There was no correlation in test retest variability with age, refractive error, or severity of Glaucoma. Angular or clock hour position did not show any specific correlation. Mean of normal RNFL thickness at one of the clock hour position was 1.066 ± 0.73 micron and mean of RNFL thickness in affected clock hour position was 10.3 ± 4.9 micron ($p < 0.0000$).

Conclusions: Spectral-Domain OCT does show intertest or test retest variability of RNFL thickness at some location in 6x6 mm square parapapillary region, however that is not observed in significant number of patients however RNFL thickness deviation is significant in these patients. Test retest variability is free of age, refractive error and severity of Glaucoma. One must take in to account this while interpreting the results. Intertest variability was seen at angular or clock hour position more often, than to four quadrant however mean RNFL thickness remained same

P280 RELATIONSHIP BETWEEN SHORT-WAVELENGTH AUTOMATIC PERIMETRY (SWAP) AND HEIDELBERG RETINA TOMOGRAPH (HRT) IN EYES WITH OCULAR HYPERTENSION (OHT)

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Aims: To compare and correlate optic nerve head parameters obtained by HRT with defects detected by short-wavelength automatic perimetry (SWAP) in eyes with ocular hypertension (OHT).

Methods: The study included 1 eye of 130 ocular hypertensive patients with a mean age of 47 ± 12 years. All subjects had reliable visual fields and HRT measurements performed within a 2-week period. The eyes were classified as normal/abnormal according to visual field criteria and Moorfields regression analysis (MRA). Correlations between visual field indices {mean deviation, pattern standard deviation (PSD) and corrected PSD} and HRT parameters were analyzed using Spearman correlation coefficient (r) and the agreement between the tests in classifying eyes was defined with k value.

Results: The mean central corneal thickness (CCT) was 559 ± 37 μ m. Twenty-five eyes (19.2%) had SWAP visual field defects. Twenty eight eyes (21.5%) had abnormal HRT evaluation. Six eyes (4.6%) had abnormal HRT evaluation and SWAP visual field defects. Another nine eyes had 'suspicious' HRT evaluation and SWAP visual field defects. The k values was 0.12 for SWAP and MRA ($p = 0.12$). Eyes with pathological MRA had significantly reduced CCT ($p = 0.029$) whereas eyes with SWAP visual field defects did not defer in CCT. No statistical significant correlation between HRT and SWAP parameters was detected.

Conclusions: SWAP visual field defects may coexist with abnormalities of optic disk detected by HRT in eyes with OHT. In most eyes, however, the two methods detect different glaucoma properties.

P281 CHOROIDAL THICKNESS EVALUATION IN OPEN-ANGLE GLAUCOMA BY ENHANCED DEPTH IMAGING: A PRELIMINARY STUDY

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Background: Enhanced Depth Imaging (EDI) is a recent spectral domain OCT acquisition method. This technique allows choroidal thickness (CT) measurement. The authors report results from a preliminary study comparing CT in normal and glaucomatous eyes.

Methods: The aim of this study was to measure subfoveal CT in normal and glaucomatous eyes and to evaluate the EDI technique. 17 eyes of 9 healthy subjects where compared with 23 eyes of 14 glaucomatous patients. CT has been evaluated with a Spectralis OCT. A section was obtained within a 30 degree scan centered on the fovea, with 100 scans averaged for each section. 2 acquisitions were performed for each eye by the same operator in order to use an average CT measurement (Fig. 1). Results were compared with clinical examination data (refractive error, peripapillary atrophy and age).

Results: The two CT measurements were strongly correlated $r = 0.99$ ($p < 0.001$). In the healthy group, mean age was 72.76 ± 7.71 years, mean refractive errors was 0.71 ± 0.74 D and peripapillary atrophy was present in 29% of the eyes. Mean subfoveal CT was 224.38 μ m. In the glaucomatous group, mean age was 71.39 ± 11.37 , mean refractive error was -1.37 ± 2.74 D and peripapillary atrophy was present in 70% of the eyes. Mean subfoveal CT was 219.98 μ m. No significant difference between the two groups was demonstrated for the subfoveal CT or refractive errors. In both groups, there was a negative correlation between CT and peripapillary atrophy. In healthy eyes, peripapillary atrophy was correlated with age ($p < 0.001$), whereas it wasn't in the glaucomatous population ($p = 0.795$).

Conclusion: This is the first study, in our knowledge, evaluating EDI OCT in glaucomatous eyes. Reproducibility is excellent. CT and peripapillary atrophy were always negatively correlated. No CT difference in the normal or glaucomatous group was found but the studied population's effective was limited. Further studies are required to evaluate a relationship between CT and peripapillary atrophy and the link with the evolutive stage of the glaucomatous neuropathy.

P282 STRUCTURE-FUNCTION RELATIONSHIPS USING ENHANCED AND VARIABLE CORNEAL COMPENSATION SCANNING LASER POLARIMETRY: COMPARISON WITH SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY

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Background: To evaluate and compare the regional relationships between visual field sensitivity and retinal nerve fiber layer (RNFL) thickness as measured by spectral-domain optical coherence tomography (OCT), scanning laser polarimetry with variable (GDx VCC) and enhanced (GDx ECC) corneal compensation. To evaluate and compare the discriminating abilities of each of these RNFL imaging devices among healthy eyes, suspected glaucoma and glaucoma.

Methods: Prospective cross-sectional study. One hundred and fifty eyes of 150 patients (50 with healthy eyes, 50 with suspected glaucoma, and 50 with glaucoma) were tested on Cirrus-OCT, GDx VCC, GDx ECC, and standard automated perimetry. Data on RNFL thickness were extracted for 256 peripapillary sectors of 1.40625 degrees each for the OCT measurement ellipse and 64 peripapillary sectors of 5.625 degrees each for the GDx VCC and GDx ECC measurement ellipse. Correlations between peripapillary RNFL thickness in 6 sectors and visual field sensitivity in the 6 corresponding areas were evaluated using linear and logarithmic regression analysis. Receiver operating curve areas were calculated for each instrument.

Results: With spectral-domain OCT, the correlations ($r(2)$) between RNFL thickness and visual field sensitivity ranged from 0.123 (nasal RNFL and corresponding visual field area, linear regression) to 0.876 (supratemporal RNFL and corresponding visual field area, logarithmic regression). By comparison, with GDx-VCC and GDx ECC, the correlations respectively ranged from 0.079 and 0.122 (nasal RNFL and temporal RNFL, with the corresponding visual field area, linear regression) to 0.403 and 0.642 (supratemporal RNFL and inferotemporal RNFL with the corresponding visual field area,

logarithmic regression). The structure-function correlations were generally stronger with spectral-domain OCT than with GDx ECC, with GDx ECC than with GDx VCC, and with logarithmic regression than with linear regression. The largest areas under the receiver operating curve were seen for GDx ECC nerve fiber indicator (NFI) ($0.981 \pm .096 - p < .001$) in eyes with glaucoma and for GDx ECC NFI ($0.924 \pm .102 - p < .001$) in eyes with suspected glaucoma.

Conclusions: The structure-function relationship was significantly stronger with spectral-domain OCT than with scanning laser polarimetry GDx ECC, and with GDx ECC than with GDx VCC. This relationship was better expressed logarithmically than linearly. Measurements with these different instruments should not be considered to be interchangeable.

P283 NORMATIVE DATA OF ONH, RNFL AND GCC ON FOURIER DOMAIN OCT. IS IT APPLICABLE IN BLACK SOUTH AFRICAN EYES?

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Objectives: 1) To study the Optic Nerve Head (ONH), Retinal Nerve Fiber Layer (RNFL) and Ganglion Cell Complex (GCC) parameters in a group of normal eyes in black South Africans. 2) To compare the normative data in the study group with other ethnic group studies (Hispanic, Afro-American, Caucasian and Asian)

Design: Prospective, observational study of randomly selected normal eyes from Eye clinic patients.

Material and Method: 30 eyes were studied in adult patients with no ocular disease or disorder. All subjects underwent a complete ophthalmologic examination to confirm normal anterior segment and fundus. All OCT scans were performed on RTVue Fourier-Domain OCT (FD-OCT) with recommended provider protocols. Statistical analysis of the data was done with T test, mean and standard deviation and Confidence Interval (95%).

Results: Mean and Standard deviation for Optic Nerve Head (ONH) was 2.07 and 0.59. For Retinal Nerve Fibre Layer (RNFL) was 114.6 and 12.9 and for Ganglion Cell Complex (GCC) was 99.10 and 1.50. This data was found to be closer to the Hispanic ethnic group rather than Afro American group. Caucasian and Asian values were significantly different from our cohort.

Conclusions: Although our sample size is small, we have established that the normative data of black South Africans is closer to Hispanic ethnic group. At this point of time we are not in position to recommend change in clinical evaluation of data using this ethnic normative data. Further larger group analysis is underway to make such recommendations.

Clinical Examination Methods: Blood Flow and Perfusion

P284 CHANGES IN OPTIC NERVE HEAD BLOOD FLOW FOLLOWING APPLICATION OF TAFLUPROST IN NORMAL SUBJECTS

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Background: Tafluprost is a new prostaglandin F2 α analogue in clinical use for the treatment of ocular hypertension and glaucoma. We evaluated changes in optic nerve head blood flow following application of tafluprost in normal subjects using laser speckle flowgraphy (LSFG), a non-invasive technique that can measure real-time, two-dimensional relative blood flow velocity of ocular microcirculation using the laser speckle phenomenon.

Methods: This prospective study included 9 eyes of 9 normal Japanese subjects [average (\pm standard deviation) age = 36.3 ± 8.0 years]. Each eye had a best corrected visual acuity of 20/25 or better, a spherical equivalent refractive error between -5 and +5 diopters, a normal intraocular pressure (IOP) below 21 mmHg, and no significant ocular disease upon routine ophthalmological examination. Each subject had no history of systemic disease such as diabetes mellitus, hypertension, or heart disease. Before application of tafluprost, we measured IOP, brachial artery blood pressure, and pulse rate. After mydriasis, we measured the mean blur rate (MBR), a quantitative index of relative blood flow velocity, in the overall, superior, temporal, inferior, and nasal regions of the optic nerve head using the LSFG Analyzer (Softcare, Ltd., Ilzuka, Japan; version 3.0.20.0). After 7 days of application of 0.0015% tafluprost once daily, the same examinations were performed again, and the IOPs, mean systemic blood pressures [diastolic blood pressure + 1/3 (systolic minus diastolic blood pressure)], perfusion pressures (2/3 mean systemic blood pressure minus IOP), pulse rates, and MBRs before and after application of tafluprost were compared.

Results: The average IOPs, mean systemic blood pressures, perfusion pressures, and pulse rates before and after application of tafluprost were 14.9 ± 2.2 and 11.6 ± 3.1 mmHg, 97.8 ± 14.5 and 97.3 ± 9.2 mmHg, 50.3 ± 10.6 and 53.3 ± 7.1 mmHg, and 83.1 ± 20.7 and 84.7 ± 21.9 , respectively. The average MBRs in the overall, superior, temporal, inferior, and nasal regions of the optic nerve head before and after application of tafluprost were 12.2 ± 1.7 and 12.7 ± 1.9 , 13.2 ± 2.8 and 13.7 ± 2.8 , 8.5 ± 2.0 and 8.9 ± 2.2 , 13.4 ± 1.7 and 13.9 ± 2.1 , and 13.7 ± 1.3 and 14.1 ± 1.6 arbitrary units, respectively. The average IOP after application was significantly lower than that before application ($p = 0.030$). The average mean systemic blood pressure, perfusion pressure, and pulse rate after application were not significantly different from those before application ($p \geq 0.139$). The average MBRs after application were significantly higher than those before application in the overall ($p = 0.008$), superior ($p = 0.044$), and temporal ($P = 0.044$) regions of the optic nerve head. The average MBRs after application were not significantly different from those before application in the inferior and nasal regions of the optic nerve head ($p \geq 0.066$).

Conclusion: Application of tafluprost for 7 days may increase optic nerve head blood flow in normal subjects.

P285 OCULAR PERFUSION PRESSURE AND RETRO-BULBAR HAEMODYNAMICS IN DIFFERENT TYPES OF GLAUCOMA

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Background: Previous investigations have shown that

altered perfusion of the optic nerve may be pathogenetically relevant in different types of glaucoma. This study aimed at comparing ocular perfusion pressure (OPP) and color Doppler Imaging (CDI) measurements in ophthalmic artery (OA) and to describe the correlation between CDI and OPP in normal tension (NTG), pseudoexfoliative (XFG), primary open angle (POAG) glaucoma patients and healthy controls.

Methods: Forty-four NTG, 47 PXG, 41 POAG patients and 40 healthy controls were evaluated (Tab. 1). One eye per subject was considered. Intraocular pressure and systolic and diastolic blood pressure were measured by Goldmann applanation tonometry and Riva-Rocci sphygmomanometer. Mean and diastolic OPP (mOPP and dOPP) were calculated. Retrobulbar haemodynamic measurements were recorded by CDI. Differences in OPP and CDI parameters between groups were assessed by ANOVA for repeated measures and Student's t-test. The correlations between resistivity index of ophthalmic artery (RI-OA) and OPPs were evaluated by Pearson's correlation analysis.

Results: mOPP and dOPP were reduced in NTG compared to PXG, POAG and controls ($p < 0.001$) (Tab. 2). Comparisons between glaucoma subgroups revealed that mOPP was lower in NTGs than in XFGs and POAGs ($p < 0.001$) and in XFG than in POAGs ($p = 0.032$). Similarly, dOPP was lower in NTGs than in XFGs ($p = 0.020$) and POAGs ($p < 0.001$) and in XFGs compared to POAGs ($p = 0.004$). Resistivity index of ophthalmic artery was higher in XFGs than in NTGs, POAGs and controls ($p < 0.001$) (Tab. 3). Subgroups analysis showed that RI-OA was more elevated in XFGs than in NTGs and POAGs ($p < 0.001$) and in NTGs than in POAGs ($p = 0.022$). Resistivity index of ophthalmic artery negatively correlated with mOPP and dOPP in NTGs ($r = -0.342$, $p = 0.023$; $r = -0.371$, $p = 0.013$) and XFGs ($r = -0.603$, $p < 0.001$; $r = -0.539$, $p < 0.001$).

Conclusion: This study, by showing reduced ocular perfusion pressures and elevated resistivity index of ophthalmic artery, demonstrated a reduced perfusion of the optic nerve in normal tension and pseudo-exfoliative glaucoma. A state of vascular dysregulation of the optic nerve is suggested in these two types of the disease, more evident in pseudo-exfoliative glaucoma.

P286 ASSOCIATION OF OPTIC NERVE HEAD BLOOD FLOW AND OPTIC DISC STRUCTURE IN THE NORMAL AND GLAUCOMA PATIENTS

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Background: To investigate whether the microcirculation of optic nerve head was correlated to the optic disc structure in the patients with open-angle glaucoma (OAG).

Methods: One hundred fifteen eyes (34 control, 40 large cup disc (LCD), and 41 glaucoma) were included in this study. LCD was defined as (1) within normal limits in Glaucoma Hemifield test of Humphrey Field Analyzer (HFA, SITA standard), (2) Cup to Disc area (C/D) ratio of HRTII was more than 0.47. Optic disc structure was evaluated by HRTII and average thickness of retinal nerve fiber layer thickness (avg RNFLT) was measured by OCT3. The microcirculation of optic nerve head was examined with a laser speckle flowgraphy (LSFG-NAVI, Softcare Ltd, Fukuoka, Japan) and the

mean blur rate (MBR) of all mean (AM), vessel mean (VM), and tissue mean (TM) was calculated. The correlation was evaluated with a Spearman rank correlation coefficient. Logistic analysis of MBR values to differentiate the patients with LCD and GE, Area Under the Curve (AUC) for MBR was calculated by receiver operating characteristics (ROC).

Results: The correlation coefficients to AM were significant in Mean Deviation of HFA ($r = 0.46$, $p < 0.01$) and avgRNFLT ($r = 0.61$, $p < 0.01$), and C/D ratio ($r = -0.57$, $p < 0.01$). Compared to control group (53.4 ± 6.5), VM in LCD (48.7 ± 5.8 , $p = 0.03$) and glaucoma group (45.0 ± 7.1 , $p < 0.01$) was significantly smaller. While TM of glaucoma groups (11.3 ± 2.2) was significantly smaller in than that in LCD (13.0 ± 2.2 , $p < 0.01$) and control groups (13.4 ± 2.0 , $p < 0.01$). ROC curve analysis revealed that cut-off values was 19.3 in AM (AUC, sensitivity, specificity: 0.71, 0.45, 0.94, respectively), 39.6 in VM (0.61, 0.30, 0.96), and 11.3 in TM (0.71, 0.64, 0.80).

Conclusion: These results suggested that the decreased optic nerve head blood flow both in vessel and tissue was significantly affect the status of optic nerve head structures in the patients with glaucoma.

P287 RETINAL NERVE FIBER LAYER THICKNESS CORRELATES WITH DT-MRI MEASURE 'RADIAL DIFFUSIVITY' REFLECTING MYELIN DAMAGE IN THE OPTIC RADIATION IN GLAUCOMA

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Purpose: In glaucoma damage of retinal ganglion cells may continue to the linked optic radiations (OR). This damage may concern the axonal integrity as well as demyelination or glia cell impairment. This study investigated measures of axonal demyelination, i.e., radial diffusivity (RD), in the optic radiation of glaucoma patients. The results were correlated with the homonymous retinal nerve fiber layer thickness (RNFL).

Methods: Fourteen control subjects (mean age, 52.0 ± 11.7 years) were age-adjusted to 12 patients with normal-tension glaucoma (NTG, mean age, 58.3 ± 9.5 years; $p = 0.157$) and 18 patients with primary open-angle glaucoma (POAG, mean age, 55.7 ± 7.3 years; $p = 0.296$). The control subjects had eye diseases without neuronal participation. All subjects underwent magnetic resonance (MR) tomography-based diffusion tensor imaging (DTI) of the optic radiation and eye examination by the Spectralis optical coherence tomography. MR images did not show cerebral space occupying lesions along the visual pathway. The optic radiations in the DTI were outlined semi-automatically and the mean values of FA and RD of both OR's were measured. The homonymous RNFL thickness corresponding to the respective OR was calculated.

Results: If corrected for age, gender, and diagnosis groups (control, NTG, POAG) partial correlation analysis disclosed a correlation between RD and the RNFL thickness (right OR: $r = -0.350$, $p = 0.025$; left OR: $r = -0.478$, $p = 0.002$).

Conclusion: In glaucoma DTI-derived parameters of axonal

integrity and demyelination of the optic radiation (4th neuron) are suggested to change with decreasing retinal nerve fiber layer thickness (3rd neuron), i.e. with increasing glaucoma severity.

P288 OCULAR PERFUSION PRESSURES AND RETINAL AND NEURORETINAL RIM BLOOD FLOW IN PRIMARY OPEN-ANGLE GLAUCOMA PATIENTS

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Background: To evaluate a possible association between systemic vascular factors and blood flow perfusion in the peripapillary retina and in the optic nerve head, in patients with primary open-angle glaucoma (POAG) and to identify the best indicator of the ocular perfusion pressure. In particular, we tried to verify the existence of a correlation between the ocular mean, ocular systolic and ocular diastolic perfusion pressure vs the peripapillary retinal and neuroretinal rim blood flow.

Methods: Thirty-eight patients with primary open-angle glaucoma (15/23 male/female, mean age 60.71 ± 6.56 ys; range 45-70 ys) under medical antiglaucomatous therapy were studied. IOP, systemic arterial pressure were measured. We calculated the ocular mean (OMPP = mean blood pressure – IOP), systolic (OSPP = systolic blood pressure – IOP) and diastolic perfusion pressure (ODPP = diastolic blood pressure – IOP). Visual Field through Humphrey Field Analyzer were also performed. Peripapillary retinal and neuroretinal rim blood flow were measured with the Heidelberg Retina Flowmeter (HRF). The HRF regions of interest were superior and inferior peripapillary retina (temporal and nasal) and neuroretinal rim at the temporal side. The analysis of the flow has been made on every image through the AFFPIA – SLDF (3.3 version). Finally we gathered the flow values of the temporal peripapillary retina (mean between superior and inferior), nasal peripapillary retina (mean between superior and inferior) and neuroretinal rim. Statistical analysis was conducted using the Pearson's test; significance was set at $p < 0.05$.

Results: Mean IOP values 15.7 ± 3.5 mmHg; mean systemic arterial pressure values: SBP 121.0 ± 11.2 mmHg, DBP 75.1 ± 10.0 mmHg and MBP 90.6 ± 9.6 mmHg. Mean VF values PSD 5.74 ± 4.4 dB and MD -6.32 ± 6.2 dB. Mean HRF values: temporal flow: 238.71 ± 50.9 AU; nasal flow: 219.25 ± 61.3 AU, neuroretinal rim flow 172.50 ± 98.35 AU. The correlations were the follows: OMPP – Temporal peripapillary retinal blood flow ($r = 0.41$; $p = 0.01$); OMPP – Nasal peripapillary retinal blood flow ($r = 0.36$; $p = 0.02$); OMPP – Neuroretinal rim blood flow ($r = 0.02$; $p = 0.9$); OSPP – Temporal peripapillary retinal blood flow ($r = 0.37$; $p = 0.02$); OSPP – Nasal peripapillary retinal blood flow ($r = 0.38$; $p = 0.02$); OSPP – Neuroretinal rim blood flow ($r = -0.06$; $p = 0.7$); ODPP – Temporal peripapillary retinal blood flow ($r = 0.28$; $p = 0.09$); ODPP – Nasal peripapillary retinal blood flow ($r = 0.20$; $p = 0.2$); ODPP – Neuroretinal rim blood flow ($r = 0.07$; $p = 0.7$).

Conclusions: Our findings show that OMPP and OSPP are statistically correlated to peripapillary retinal blood flow, more than ODPP. Neuroretinal rim blood flow was not related to ocular perfusion pressure, probably because of the high variability of results.

P289 CORRELATION BETWEEN GLAUCOMA DAMAGE AND OCULAR PULSE AMPLITUDE MEASURED WITH A DYNAMIC CONTOUR TONOMETER

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Purpose: The difference between mean minimum and mean maximum of pulse curve is called ocular pulse amplitude (OPA). Pascal Dynamic Contour Tonometer (DCT) calculated automatically during each IOP measurement. In this study we evaluated whether OPA was correlated to the glaucoma damage in healthy subjects and in primary open-angle glaucomatous patients.

Methods: This is a prospective cross-sectional study. 90 normal and 72 glaucomatous eyes were selected for this study. Glaucomatous patients had to be under treatment with either a prostaglandin or a β -blocker in a monotherapy regimen. Normal subjects had to have normal visual field and optic nerve head, untreated intraocular pressure below 21 mmHg, no family history of glaucoma. Glaucomatous patients had typical glaucomatous visual field defects, abnormal ONH assessed using stereoview with a Volk 90° lens, open angle by gonioscopy. Pearson 'r' correlation and Student's t-test was used for the statistical analysis of the results.

Results: The mean age was 61.71 ± 16.22 (mean \pm SD) years and 69.62 ± 13.33 years, respectively, and no significant difference was found. A statistically significant ($p < 0.001$) difference was found for OPA between healthy (9.77 ± 1.14 mmHg) and glaucomatous (2.96 ± 1.06 mmHg) eyes. A mild correlation ($r = -0.16$) was found between cup/disc ratio and OPA.

Conclusion: The OPA was significantly higher in normal eyes whereas it was lower in glaucomatous patients, however a mild correlation with the structural damage was found.

P290 ASSOCIATED FACTORS WITH THE OPTIC NERVE DISC PARAMETER OF LSFG-NAVI IN THE NORMAL SUBJECT

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Background: Laser speckle flowgraphy (LSFG-NAVI) is noninvasive technique that can measure relative optic nerve head (ONH) blood flow using the laser speckle phenomenon. In this study, we investigated the factors associated with the disc parameters of LSFG-NAVI in the normal subject statistically.

Methods: Eighty one eyes of 46 healthy volunteers (male/female: 27/19) who had the regular medical checkups were included in this study. The persons with ocular diseases, history of the intraocular surgery, and systemic disease affecting the ocular blood flow like hypertension, hyperglycemia, hyperlipidemia, and smoking history were excluded in this study. Age, spherical equivalent (SE), averaged retinal nerve fiber layer thickness (avgRNFLT) were recorded. Averaged RNFLT was measured by 3D-OCT 1000 (TOPCON). As the optic disc parameters of LSFG-NAVI, mean blur rate (MBR), skew, and blowout score (BOS) were assessed by equipped software (LSFG Analyzer) at vessel mean (VM), tissue mean (TM), or all mean (AM), separately. After the slit

lamp examination, the pupil was dilated and fundus check with the indirect ophthalmoscopy, digital fundus photograph, OCT, and LSFG were performed. Each parameter was analyzed using Spearman's rank correlation coefficient and $P < 0.05$ was considered significant.

Result: The average of each parameter was as follows; 60.0 ± 10.2 years in age, -1.9 ± 2.6 D in SE, 121.8 ± 10.3 μ m in avgRNFLT, 49.2 ± 6.4 in VM-MBR, 14.0 ± 1.6 in TM-MBR, 29.0 ± 4.2 in AM-MBR, 11.9 ± 1.3 in VM-skew, 13.2 ± 1.5 in TM-skew, 12.3 ± 1.3 in AM-skew, 77.5 ± 5.4 in VM-BOS, 73.7 ± 5.5 in TM-BOS, and 76.5 ± 5.4 in AM-BOS. Age was significantly correlated with VM-MBR ($r = -0.50$, $p < 0.001$), AM-MBR ($r = -0.37$, $p < 0.001$), VM-skew ($r = 0.42$, $p < 0.001$), TM-skew ($r = 0.45$, $p < 0.001$), AM-skew ($r = 0.48$, $p < 0.001$), and TM-BOS ($r = -0.27$, $p = 0.015$). SE was significantly correlated with TM-MBR ($r = -0.27$, $p = 0.018$), TM-skew ($r = -0.29$, $p = 0.010$), and AM-skew ($r = -0.24$, $p = 0.029$). AvgRNFLT was significantly correlated with VM-MBR ($r = 0.28$, $p = 0.011$), AM-MBR ($r = 0.28$, $p = 0.011$), VM-skew ($r = -0.30$, $p = 0.007$), TM-skew ($r = -0.23$, $p = 0.036$), and AM-skew ($r = -0.30$, $p = 0.006$).

Conclusion: In normal subject, the some specific disc parameters of LSFG-NAVI were significantly correlated with aging, myopia, and thickness of nerve fiber layer. Age was correlated with LSFG parameters, especially with VM-MBR and skew. These data suggest that VM-MBR and skew are suitable for the aging research and also age-matched comparison is better when the parameters of LSFG are used for analysis.

P292 SYMPATHETIC HYPERACTIVITY AND ENDOTHELIAL PERIPHERAL DYSFUNCTION IN NORMAL-TENSION GLAUCOMA PATIENTS

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Background: Defective cardiovascular neuroregulation has been advocated as a possible main contributing factor in the etiology of normal-tension glaucoma (NTG). The purpose of the study was to define parameters of autonomic nervous system activity and peripheral vascular reactive hyperemia in NTG patients.

Methods: Ambulatory automated 24-hour electrocardiogram and blood pressure (BP) monitoring by using Lifecard CF and SpaceLab 90207-30 combined with occlusion provocation test were carried out in 54 NTG patients (44 women, mean age 59.7) and 43 control subjects (34 women, mean age 57.0), who were matched for age, gender and medication. Heart rate variability (HRV) time and frequency domain parameters [low-frequency (LF), high-frequency (HR) and LF/HF ratio], and blood pressure variability (BPV), calculated with the value of standard deviation in 24-hour BP measurement were calculated and analyzed for both study groups. Postocclusive hyperemia response parameters (*TM – time to peak flow*, *TH – half-time hyperaemia*, *TR – time to rest flow*, *BZ – biological zero* and *MAX – maximum hyperemic response*) were compared for patients with a nocturnal fall in mean blood pressure (MPB) of less than 10% (non-dippers), of 10-20% (dippers) and of more than 20% (over-dippers).

Results: NTG patients demonstrated higher LF and LF/HF values for 24-hour period, day-time and night time than control subjects. There was no difference in BPV between study groups (10.4 ± 1.9 vs. 10.5 ± 2.1 , $p = 0.790$). In NTG patients, TH was significantly higher (79.0 ± 80.9 s vs. 51.5 ± 35.3 s, $p = 0.028$) and BZ was significantly lower (2.3 ± 1.0 vs. 3.1 ± 2.0 , $p = 0.009$) as compared to the control group. There was statistically significant difference between non-dippers, dippers and over-dippers in the BZ parameter (2.3 ± 0.9 vs. 2.7 ± 1.3 vs. 1.4 ± 0.4 $p = 0.024$).

Conclusions: NTG patients exhibit sympathetic hyperactivity and an abnormal peripheral hyperemia response as compared to healthy subjects.

P293 RETINAL BLOOD FLOW MEASUREMENTS USING DOPPLER FOURIER-DOMAIN OPTICAL COHERENCE TOMOGRAPHY IN GLAUCOMATOUS EYES WITH SINGLE-HEMIFIELD DAMAGE

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Background: Vascular factors have been suggested to impact the risk for development and progression of glaucomatous optic neuropathy and visual field loss. This study was conducted to examine the hypotheses that retinal blood flow (RBF) measurements are significantly reduced in the abnormal visual hemifield of glaucomatous eyes with single-hemifield damage; and examine the association between RBF, retinal sensitivity and retinal nerve fiber layer thickness (RNFL) in the normal and abnormal hemifields.

Methods: Glaucomatous eyes with visual field loss confined to a single hemifield underwent Fourier-domain optical coherence tomography (FDOCT, RTVue, Optovue Inc, Fremont, CA), Doppler FDOCT, and standard automated perimetry (SAP). Mean retinal sensitivity values were calculated in the normal and abnormal SAP hemifields using the average of 26 of the 52 test locations. Using Doppler FDOCT a double-circle scanning pattern was used to measure the RBF around the optic nerve head, transecting all retinal branch arteries and veins. The identification of veins was based on disc photograph registered with Doppler image. The flow was derived from the recorded Doppler frequency shift and the calculated angle between the probe beam and blood vessel. Total retinal blood flow was obtained by adding flow from all veins. Flow values from an eye were deemed acceptable only if greater than 63% of the venous cross-sectional area met criteria for acceptable Doppler angle and angle variability. Mean RBF was also calculated for each corresponding retinal hemifield. RBF parameters included in the analyses consisted of total, superior and inferior hemispheric blood flow, and total venous area and venous velocity. Structural parameters included were average, superior and inferior RNFL thickness.

Results: Forty-one glaucomatous eyes were screened, and 9 eyes of 9 patients (mean age 64 ± 11 yrs) meeting eligibility criteria were included. Thirty-two eyes were excluded due

to weak signal strength index, improper position of inner limiting membrane or low valid venous area percentage. Mean RBF was significantly ($p = 0.006$) reduced in the retinal hemisphere associated with abnormal SAP hemifield ($16.9 \pm 7.2 \mu\text{L}/\text{min}$) compared with the normal retinal hemisphere ($22.8 \pm 8.4 \mu\text{L}/\text{min}$). Mean retinal sensitivity was significantly ($p = 0.046$) reduced in the abnormal hemifield ($20.5 \pm 9.0 \text{ dB}$) compared with the normal hemifield ($27.9 \pm 1.3 \text{ dB}$). RBF in the abnormal hemifield was significantly associated with RNFL thickness ($r = 0.83$, $p = 0.01$) in corresponding hemisphere. Total RNFL thickness ($96.0 \pm 13.1 \mu\text{m}$) was associated ($r = 0.79$, $p = 0.02$) with total venous velocity ($12.7 \pm 8.8 \text{ mm}/\text{sec}$).

Conclusion: In glaucomatous eyes with single-hemifield damage, retinal blood flow measure was significantly reduced in the hemisphere with abnormal SAP compared with the normal hemisphere suggesting that glaucoma is associated with vascular changes in the retina.

P294 COMPARISON OF SITTING AND SUPINE DIASTOLIC BLOOD PRESSURE (BP) AND MEAN OCULAR PERFUSION PRESSURE (OPP) IN PATIENTS UNDERGOING DIURNAL INTRAOCULAR PRESSURE MONITORING

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Purpose: To compare the diastolic blood pressure (BP) and mean ocular perfusion pressure (OPP) in sitting and supine position in patients undergoing diurnal intraocular pressure (IOP) monitoring.

Methods: 100 consecutive patients undergoing diurnal IOP monitoring were included in the study. Patients had normal-tension glaucoma (NTG) and primary open-angle glaucoma (POAG) showing progression or were NTG suspects. Sitting BP was measured at 8.30, 12.30 and 16.30. Supine BP was measured at 12.30 after placing the patient supine for 30 minutes. Ocular perfusion pressure (OPP) was measured with the following formula: $\text{OPP} = (1/3 \text{ systolic pressure} + 2/3 \text{ diastolic pressure}) * 2/3 - \text{IOP}$.

Results: 28 POAG, 34 NTG, and 38 NTG suspects were included. 46 were Caucasians, 31 African-Caribbeans and 23 Asians. Mean supine diastolic BP (71.2 mmHg) was significantly lower ($p < 0.001$) than mean sitting diastolic BP at 12.30 (78.8 mmHg) and was also significantly lower compared to any mean diastolic BP during the monitoring period ($p < 0.001$). OPP was significantly lower at the supine position (39.6 mmHg RE, 39.8 LE mmHg) than the mean sitting OPP (45.9 mmHg RE, 42.3 mmHg LE) at 12.30 for both eyes ($p < 0.001$). Mean supine OPP was the lowest of the whole monitoring period for both eyes ($p < 0.001$). A trend for more pronounced decrease in the BP and OPP at the supine position was observed in the group of Caucasians and also in the group of POAG.

Conclusion: BP and OPP appear to be significantly lower in the supine rather than the sitting position in POAG, NTG and NTG suspects undergoing diurnal pressure monitoring. Measuring BP and OPP at normal working hours may allow the detection of at least a part of the BP and OPP decreases expected during the night.

P295 IMPAIRED AUTOREGULATION OF RETROBULBAR BLOOD FLOW IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Background: There is evidence from a variety of studies that blood velocities in retrobulbar arteries are reduced in primary open-angle glaucoma (POAG). The present study seeks to investigate whether autoregulation of retrobulbar blood flow is impaired in patients with POAG. For this purpose, the association between retrobulbar blood flow velocities and systemic blood pressure is measured in a group of patients with POAG and healthy subjects and used as an indicator of a possible vascular dysregulation.

Methods: The study comprised 252 patients with POAG and 198 healthy age-matched control subjects. Systemic blood pressure was measured non-invasively using automated oscillometry. Retrobulbar mean flow velocity (MFV) in the ophthalmic artery (OA), the posterior ciliary arteries (PCA), and central retinal artery (CRA) were measured using color Doppler imaging (CDI).

Results: No difference in mean arterial pressure was observed between the two groups. As expected, intraocular pressure was higher in POAG patients compared with healthy controls. All retrobulbar blood flow velocities were significantly reduced in POAG patients compared with healthy control subjects ($p < 0.01$ each). In addition, the correlation between MFV and mean arterial blood pressure in the CRA was more pronounced in patients with POAG than in healthy control subjects.

Conclusions: Our results confirm that retrobulbar blood flow velocities are reduced in POAG patients. In addition, an abnormal correlation between blood velocities and mean arterial blood pressure was found in POAG. This indicates that autoregulation is compromised in patients with POAG.

Clinical Examination Methods: Ultrasonography and Ultrasound Biomicroscopy

P296 HIGH FREQUENCY ULTRASOUND IMAGING IN VISCOCANALOSTOMY

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Purpose: To evaluate by high frequency ultrasound imaging the anatomical characteristics of viscocanalostomy and their relationship with the intraocular pressure (IOP) lowering.

Methods: A transversal study which included 9 eyes (7 patients) undergoing viscocanalostomy and examined by high frequency ultrasound (80 MHz). Several variables were evaluated, including the presence of the intrascleral space, the maximum length and height of the intrascleral space and the minimum thickness of residual trabeculo-Descemet membrane (TDM). Surgical success was considered to be achieved when IOP was $< 22 \text{ mmHg}$ or the IOP was lowered by more than 20% without the use of any medication. The

possible association between ultrasound variables and the surgical outcome was determined.

Results: The mean time between surgery and the ultrasound examination was 15.5 ± 8.8 months (range 6-29). The mean IOP decreased from a preoperative value of 23.5 ± 6.9 mmHg (range 13.7-32.0) to 14.5 ± 2.4 mmHg (range 10.7-17.3) post-operative ($p < 0.05$). The presence of an intrascleral space was a common finding. The mean length of the intrascleral space was 1.83 ± 0.51 mm, the mean height was 0.36 ± 0.17 mm; and the mean TDM thickness was 0.14 ± 0.07 mm. There was a poor correlation between the level of IOP at the time of ultrasound imaging and the length of the intrascleral space ($r^2 = 0.359$), the height of the intrascleral space ($r^2 = 0.017$) or the thickness of the remaining TDM ($r^2 = 0.003$).

Conclusions: In patients undergoing viscocanalostomy, ultrasound examination after a minimum of 6-month follow-up period showed the presence of an intrascleral space in all patients. There was no statistically significant relationship between the level of IOP and the anatomical characteristics of the intrascleral space.

P297 CHANGES OF ANTERIOR SEGMENT BIOMETRY BY PERIPHERAL LASER IRIDOTOMY IN EYE WITH SHALLOW ANTERIOR CHAMBER

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Background: To identify the impact of the presence of peripheral anterior synechia on the depth of anterior segment in patients with a shallow anterior chamber after peripheral laser iridotomy by analyzing changes in the anterior segment biometry using ultrasound biomicroscopy (UBM).

Methods: Twenty eyes of twenty patients with peripheral anterior synechia and shallow anterior chamber, and another twenty eyes of twenty patients with shallow anterior chamber without peripheral anterior synechia were studied. The changes in the anterior segment biometry for each group of patients depending on the presence of peripheral anterior synechia were examined using gonioscopy and ultrasound biomicroscopy before and after the peripheral laser iridotomy.

Results: The central corneal thickness and scleral thickness of the two groups did not show significant differences ($p > 0.05$). However their anterior chamber depths, anterior chamber angles, trabecular meshwork-iris distances, and angle-opening distances 500 increased significantly after the peripheral laser iridotomy ($p < 0.05$) in both groups. Even though the increase in the anterior segment biometry was higher in the group of patients with a peripheral anterior synechia, the difference between the two groups was not statistically significant.

Conclusions: Peripheral laser iridotomy can increase the depth of anterior chamber regardless of the presence of peripheral anterior synechia.

P298 DIFFERENCES IN FILTERING BLEB STRUCTURE ASSOCIATED WITH LONG-TERM INTRAOCULAR PRESSURE CONTROL BETWEEN TRABECULECTOMY WITH AND WITHOUT AMNIOTIC MEMBRANE TRANSPLANTATION

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Background: Amniotic membrane transplantation (AMT) has been used to assist trabeculectomy based on the anti-fibrotic ability. The intraocular pressure (IOP) lowering effect of trabeculectomy primarily depends on the structure and the shape of a filtering bleb. However, there has been no study to assess the intrableb morphology after the AMT-assisted trabeculectomy. The purposes of this study were first to determine whether AMT at trabeculectomy affects intrableb structures and then to assess which intrableb parameters are significantly correlated with the IOP control using ultrasound biomicroscopy (UBM) with reference to trabeculectomy alone.

Methods: Included were 64 eyes of 56 glaucoma patients who underwent trabeculectomy with adjunctive use of 0.04% mitomycin C either without (36 eyes) or with the AMT-assisted trabeculectomy (28 eyes) more than one year prior to entry into this study. Bleb morphology was evaluated by slit-lamp biomicroscopy and radial scans of UBM images. Logistic regression analysis was conducted to identify factors that were significantly associated with the good IOP control. Main outcome measures were IOP control, bleb morphology, and intrableb fluid-filled space score (FFSS): The IOP control was defined as good when the eyes had a more than 30% decrease in the preoperative IOP and an IOP value of less than 18 mmHg if the preoperative IOP was higher than 21 mmHg. The bleb morphology was classified into types L (low reflective), H (high reflective), E (encapsulated), or F (flattened). The FFSS was graded into 0 (no space), 1 (limited space), or 2 (space extending posteriorly beyond the field of view).

Results: Intervals between surgery and the timing of the UBM examinations (median; 2.5 years for the eyes both without and with AMT) and the overall frequency of good IOP control (28/36 in the eyes without AMT and 17/28 in those with AMT; chi-square test, $p = 0.2276$) were similar between the two groups. The eyes with AMT had a significantly lower number of type H or L blebs and a higher number of type E bleb compared to those that did not undergo AMT (chi-square, $p < 0.0001$). Among independent variables, which included age, sex, glaucoma type, lens status, the number of ocular hypotensives and previous intraocular surgeries, bleb classification, and FFSS, only bleb type F was significantly associated with poor IOP control in the eyes that did not undergo AMT ($p = 0.0008$, odds ratio = 0.0256, 95% confidence interval = 0.0030 to 0.2205), whereas an FFSS 0 or 1 was significantly associated with poor IOP control in eyes that did undergo AMT (0.0026, 0.0111, 0.0006 to 0.2079 and 0.0071, 0.0167, 0.0008 to 0.3292, respectively).

Conclusions: The UBM images of blebs after trabeculectomy alone vs. AMT-assisted trabeculectomy were distinct. The bleb wall reflectivity in the former and the extent of the intrableb fluid-filled space in the latter were factors significantly associated with long-term IOP control.

P299 SEVEN-YEAR FOLLOW-UP OF SHALLOW PERIPHERAL CHAMBER EYES BY ULTRASOUND BIOMICROSCOPY

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Background: As far as we could find out, a long time follow-up of eyes with shallow peripheral anterior chamber, but no peripheral anterior synechia (PAS) by ultrasound biomicroscopy (UBM) has not been reported in the literature. We retrospectively quantified 7 year-changes in anterior segment morphology of such eyes after laser peripheral iridotomy (LPI) by gonioscopy and UBM.

Methods: Eighteen eyes with shallow peripheral anterior chamber without PAS from 11 subjects (average age: 65.1 ± 7.9 years) were treated with LPI in 2001. In 2001 before LPI and 2008, these eyes underwent gonioscopy by the same experienced ophthalmologist (A.I.) who graded the angle width according to the Shaffer's grading system, and confirmed absence or presence of PAS by compression gonioscopy if necessary. On separate days in 2001 before LPI and in 2008, the absence or presence of appositional angle closure, the angle opening distance (AOD500), the trabecular-iris angle (TIA), the trabecular-ciliary process distance and iris thickness were determined in each four quadrants under light and dark conditions using the same UBM apparatus (UBM model 840 with a 50-MHz transducer probe, Humphrey Research Division, Carl Zeiss Inc., Thornwood, NY) by same experienced ophthalmologist (S.K.S.)

Results: Before LPI and 7 years after it, intraocular pressure was 15.1 ± 3.1 mmHg and 14.9 ± 2.1 mmHg ($p = 0.84$). Seven years after LPI, gonioscopically graded angle width was significantly wider in all 4 quadrants ($p = 0.023\sim 0.000$), whereas isolated tent-like PAS developed in 12 eyes (67%). AOD500 and TIA significantly were increased ($p < 0.0001$) and prevalence of appositional angle closure reduced from 78% to 33% in light ($p = 0.007$) and from 94% to 67% in dark conditions ($p = 0.04$) respectively.

Conclusions: LPI was effective in widening the angle and reducing the prevalence of appositional angle closure for at least 7 years, but was not very effective in preventing future PAS development in Japanese eyes with shallow peripheral anterior chamber, but no PAS.

P300 ULTRASOUND BIOMICROSCOPIC COMPARISON OF PRIMARY OPEN-ANGLE GLAUCOMA AND PRIMARY ANGLE-CLOSURE GLAUCOMA EYES IN DARK AND LIGHT CONDITIONS

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Background: Ultrasound biomicroscopy is a useful tool in the diagnosis and management of glaucoma. We aim to look at differences in anterior segment parameters of eyes with primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG) in dark and light conditions.

Methods: Ultrasound biomicroscopy was performed for 30

subjects with PACG and 30 subjects with POAG at initial presentation before any treatment. Measurements of angle opening distance (AOD-500 and AOD-750) and trabecular-iris space area (TISA-500 and TISA-750) 500 and 750 µm from the scleral spur in both dark and light conditions were made. Anterior chamber depth (ACD) and axial length (AL) were also measured.

Results: The mean age of PACG patients was 67.6 ± 9.6 years and POAG patients 62.1 ± 13.9 years. The mean ACD (2.70 ± 0.53 µm) in PACG patients was significantly different from that (3.32 ± 0.52 µm) of POAG patients ($p < 0.0001$). There was also significant difference ($p = 0.0004$) in the mean AL of PACG (22.91 ± 0.86 µm) and POAG (24.47 ± 1.67 µm) patients. The light – dark differences parameters in PACG and POAG eyes for the various quadrants were as follows respectively: TISA-500 (0.00035 ± 0.0059 µm and 0.0053 ± 0.038 µm), AOD-500 (0.0027 ± 0.056 µm and 0.052 ± 0.19 µm), TISA-750 (0.000017 ± 0.013 µm and 0.012 ± 0.085 µm) and AOD-750 (0.0016 ± 0.091 µm and 0.10 ± 0.25 µm) for the inferior quadrant; TISA-500 (-0.00050 ± 0.012 µm and 0.0053 ± 0.038 µm), AOD-500 (-0.011 ± 0.044 µm and 0.020 ± 0.15 µm), TISA-750 (0.00086 ± 0.24 µm and 0.019 ± 0.061 µm) and AOD-750 (-0.037 ± 0.40 µm and 0.042 ± 0.20 µm) for the superior quadrant; TISA-500 (-0.0010 ± 0.0058 µm and -0.0025 ± 0.034 µm), AOD-500 (0.0035 ± 0.029 µm and -0.027 ± 0.15 µm), TISA-750 (-0.00073 ± 0.013 µm and -0.0040 ± 0.065 µm) and AOD-750 (-0.0025 ± 0.12 µm and 0.015 ± 0.26 µm) for the nasal quadrant; TISA-500 (0.0060 ± 0.017 µm and 0.0067 ± 0.045 µm), AOD-500 (0.019 ± 0.095 µm and -0.026 ± 0.15 µm), TISA-750 (0.013 ± 0.033 µm and 0.012 ± 0.091 µm) and AOD-750 (0.039 ± 0.16 µm and -0.014 ± 0.25 µm) for the temporal quadrant. Of the above comparisons, the only near significant light-dark difference between PACG and POAG eyes was found in AOD-750 in the inferior quadrant ($p = 0.0524$). Interestingly, there was no significant difference in light-dark changes between POAG and PACG eyes for all other parameters in all 4 quadrants.

Conclusions: There is significant difference in mean AL and ACD between PACG and POAG eyes. The light-dark difference in PACG eyes is smaller than that of POAG eyes for all AOD and TISA values in all 4 quadrants. However, except for AOD-750 in the inferior quadrant, there was no significant difference between PACG and POAG eyes in terms of light-dark difference in anterior segment parameters. Further evaluation of the above findings could be done in future with a larger population.

P301 PREVALENCE OF PLATEAU IRIS IN PRIMARY ANGLE-CLOSURE SUSPECTS IN INDIA

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Background: To evaluate the prevalence of plateau iris as a mechanism of angle closure in primary angle closure suspects using ultrasound biomicroscopy (UBM).

Method: This was a cross sectional study for which subjects were recruited from glaucoma clinic of tertiary care university eye centre. PACS patients who had a patent peripheral laser iridotomy and were not on any medical therapy were included. PACS was defined as posterior trabecular meshwork not visible in at least two quadrants on gonioscopy. UBM was per-

formed in a supine position with imaging of the anterior chamber angle and ciliary body area in all 4 quadrants using P 40 machine (Paradigm Medical Industries, Salt lake city, UT) in one eye. Plateau iris was defined by the presence of all of the following: anteriorly directed ciliary body pushing iris anteriorly making it parallel to trabecular meshwork, steep iris configuration followed by downward angulation, absent ciliary sulcus and iridotrabecular contact. Patients were labeled to have plateau iris when this configuration was present in at least two quadrants.

Result: Eighty two subjects were enrolled with mean age (SD) of 54.2 (6.5) years, including 50 females and 32 males. Plateau iris was found in 22 (27%) eyes. Fourteen (26.8%) eyes had plateau iris in two quadrant and 8 (9.7%) eyes had plateau iris in three quadrants. 20 out of 22 patients with plateau iris showed this configuration in the superior quadrant and it was the most commonly involved quadrant.

Conclusion: Plateau iris was found in one-fourth of subjects with PACS in the Indian population using UBM.

P302 DOPPLER IMAGING CORRELATION WITH QUANTITATIVE ANALYSIS BY OPTICAL COHERENCE TOMOGRAPHY IN PRIMARY OPEN-ANGLE GLAUCOMA

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Background: The study investigates a correlation between retrobulbar haemodynamics and structural damages detected by retinal nerve fiber layer (RNFL) and optic disc defects in patients with primary open-angle glaucoma (POAG).

Methods: 31 patients with POAG were included in this clinical study. Blood flow velocities (peak systolic velocity (PSV) and end-diastolic velocity (EDV)) of the ophthalmic artery, central retinal artery (CRA), posterior ciliary arteries (PCA) and central retinal vein were measured using colour Doppler imaging (Acuson Antares System, Siemens). Optic disc morphometry and RNFL defects have been assessed by Optical Coherence Tomography (OCT). The parameters of the optic nerve head (ONH) and retinal nerve fibre layer (RNFL) were used for analysis.

Results: The study shows: – a significant ($p < 0.001$) correlation of the PSV of the CRA with rim area. – a significant ($p < 0.001$) correlation of the minimum velocities of the CRV with RNFL thickness. – no correlation between flow velocities of the OA and of the PCA with morphometric parameters of the optic disc.

Conclusions: The reductions in flow velocities of the CRA and the central retinal vein emphasise the decreased retinal blood flow in POAG. The flow velocities of the CRA and of the CRV decrease with increasing optic disc damage in primary open-angle glaucoma. RNFL thickness may be a better indicator, reflecting retinal ganglion cell function and monitoring disease progression.

P303 WOW, WE FINALLY GOT A PACHY!

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Background: In 2002, the five-year report of the Ocular Hypertension Study (OHTS) was released. We read the study with rapt attention. Soon a lot of new studies highlighting the

importance of Central Corneal Thickness (CCT) were published. CCT as a significant risk factor for glaucoma had been central to the discussion of its management in all these papers. Our hospital purchased a Pachymeter only in 2009. The reason for the delay was the limited resources available in a developing country. It was with bated breath that we started to analyze our patients with glaucoma with follow-up with us for 15 years. We wanted to see if pachymetry readings would have altered Intra-ocular Pressure (IOP) targets.

Methods: Field results of 40 glaucoma patients who had been with us for 15 years were analyzed. All of them had achieved target IOP set by us before we got a pachymeter. The patients were classified as thin corneas (< 555) thick corneas (> 555) and very thin corneas (< 500). They were further classified as showing field progression and having stable fields.

Results: None of the patients had progression in field defects at the end of 15 years. Two patients with very thin corneas had field progression (after 6th year and 8th year) while on treatment before the pachy value was known. The target IOP was revised and patients had stabilized at the end of 15 years. When pachy results could be obtained our clinical decision was shown to be correct. Our consultants had already stepped up treatment for patients with thin corneas even before we had pachymetry value.

Conclusion: Our study reinforces the strength of the correlation of CCT to the development of glaucoma over time. Though CCT is a very valuable tool, meticulous clinical examination with field charting can be good enough if lack of resources preclude the purchase of a pachymeter. Role of pachymetry becomes important if the patient does not follow up and meticulous ocular examination and field charting is not done at regular intervals.

Clinical Examination Methods: Provocative Tests

P304 TOPICAL IBOPAMINE, D1-DOPAMINERGIC AGONIST, EVIDENCES THE IMPAIRMENT OF OUTFLOW PATHWAYS IN NORMOTENSIVE CHILDREN OF PRIMARY OPEN-ANGLE GLAUCOMA PATIENTS

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Background: The peculiar characteristics of ibopamine, a D1 dopaminergic agonist, at ocular level were evidenced in 1986 by Virno et al. at the Department of Glaucoma and Ocular Physio-Pharmacology of the University of Rome 'La Sapienza'. It was shown that stimulation of D1-dopaminergic receptors implies an increase in intraocular pressure (IOP). Several clinical studies confirmed the utility of ibopamine in the diagnosis of primary open-angle glaucoma (POAG) to evaluate the functionality of aqueous humour outflow pathways. The test was positive in 96% of POAG patients and in 52% of normal-tension glaucoma patients, whilst it was negative in normal subjects without glaucomatous inheritance. Aim of the study was to show if topical ibopamine is able to

evidence, by means of an increase in intraocular pressure (IOP), the eventual impairment of outflow structures in normotensive children, aged 8 to 40 years, of POAG parents.

Methods: Group 1: 163 children (326 eyes), aged 8 to 40 years, 88 females and 75 males, mean age 24.24 ± 11.17 years, of at least one POAG parent showing values of IOP lower than 18 mmHg during repeated tonometric curves and visual fields within physiological limits and presenting no glaucomatous-like changes at the level of the optic nerve; Group 2 (control): 108 children (216 eyes), aged 8 to 40 years, 60 females and 48 males, mean age 27.83 ± 7.23 years, of healthy parents without history or existing glaucoma. Ibopamine test was performed by instilling two drops, 5 minutes apart, in both eyes followed by repeated IOP measurements over a 45-minute period. The test was considered positive if there is an IOP increase ≥ 3 mmHg after 45 minutes following instillation. Data were analyzed by the Student t-test for paired data and Pearson correlation test. P-values of 0.01 were considered statistically significant.

Results: Baseline IOP before ibopamine test was 14.61 ± 2.46 and 14.09 ± 2.17 mmHg in Group 1 and 2, respectively. The test was positive in 40% of cases in Group 1 with a mean IOP increase of 4.82 ± 1.46 ($p < 0.01$) after 45 minutes from instillation, while in all eyes of Group 2 the test was negative with even 1-2 mmHg IOP reduction (mean -0.74 ± 1.33 mmHg).

Conclusion: D1 dopaminergic stimulation due to ibopamine increases IOP as a consequence of reduced functioning of the outflow structures which becomes unable to maintain hydrodynamic balance. The study evidenced that the test was positive in 40% of normotensive children, aged 8 to 40 years, of at least one parent with POAG showing a statistically significant ($p < 0.01$) IOP increase following ibopamine administration, whilst in the control group of children of same age of healthy parents the test was negative. The positivity to the ibopamine test stands for an initial functional impairment of the outflow structures with still normal IOP with predictable predisposition to intraocular Hypertension and possible Glaucoma.

P305 COMPARISON OF WATER-DRINKING TESTS PERFORMED WITH 1000 AND 650 ML OF WATER

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Objective: To compare the intraocular pressure (IOP) profiles and discomfort during the water drinking test (WDT) performed with 1000 mL and 650 ml of water.

Methods: This prospective and observational study included 25 patients (mean age 67.1 years, 64% female) with primary open-angle glaucoma under treatment. All patients underwent the WDT twice, first with 650 ml and two weeks later with 1000 ml, always at 10am. IOP was measured at baseline and patients were then instructed to drink the water in 10 minutes. IOP measurements were obtained three times, at 15-minute intervals. At the end of the study, each patient rated the discomfort related to water intake on a scale (0 to 10). Peak IOP agreement was analyzed with Bland-Altman plot, and discomfort scores were compared using Wilcoxon Signed Ranks test.

Results: Peak IOP with 1000 ml occurred at 15 min. for 72%

patients and with 650 ml at 30 min for 56% patients. Bland-Altman plot revealed a fixed bias of 0.6 for higher peak IOP in 1000 ml test (95% limits of agreement -4.7 to 6.0). 56% patients had a difference in peak IOP on both tests smaller than 2 mmHg. Discomfort scores were smaller in 650 ml test (0.68 vs 3.52, $p < 0.001$).

Conclusion: WDT with 1000 ml and 650 ml have moderate agreement in peak IOP. Patients found 650 ml WDT more comfortable.

P306 THE DARK-ROOM TEST WITH NEW DIAGNOSTIC CRITERIA AND CLASSIFICATION

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Background: The accuracy of the dark room test judged by intraocular pressure elevation and closed anterior chamber angle after 1 or 2 hours darkadaptation was questioned by many experts. Here we introduce a new diagnostic criteria and classification of the darkroom test in order to improve its diagnostic value in detecting primary closure of the anterior chamber angle and guide the treatment.

Methods: The cross-sectional observational clinical study included suspects of primary angle closure. Using ultrasound biomicroscopy (UBM), we measured the anterior chamber angle configuration at room light and after 3 minutes of dark adaptation. The number of closed angle quadrants assessed on UBM images at room light and after 3 minutes of dark adaptation were recorded. Perkin's applanation tonometry were performed in room light conditions at baseline and after 1.5 hours of dark adaptation. The dark room test was positive, if intraocular pressure increased by ≥ 8 mmHg after 1.5 hours of dark adaptation. After the test, the eyes were divided into 5 levels according to the number of closed angle quadrants.

Results: The study included 79 subjects (79 eyes). The dark room test was positive in 38 (48%) eyes. The number of closed angle quadrants was significantly higher for the UBM examination performed at 3 minutes of dark adaptation (2.41 ± 1.17) than at room light condition (1.76 ± 1.19), $t = -6.65$ $p = 0.00$; the area under the receiver operator characteristics (ROC) curve indicated a significantly diagnostic value for UBM detected closed angle after 3 minutes dark adaptation

(0.89; $p < 0.001$) in predicting a positive dark room test. After test, there were a total of 40 eyes whose closed angle quadrants reached 3 or 4 (approximately grades Iv or v using the new grading system), indicated the need for treatment.

Conclusions: The dark room test with the new diagnostic criteria and classification had a higher diagnostic precision in predicting primary angle closure and provides guidelines for treatment.

Clinical Examination Methods: Telemedicine

P307 OPHTHALMOLOGIST-FREE GLAUCOMA CLINICS WITH VIRTUAL OPHTHALMOLOGIST OVERSIGHT: PATIENT AND PRACTITIONER EXPERIENCES

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Background: The traditional model for the care of patients with glaucoma and ocular hypertension in the UK has been Hospital Eye Service (HES) based. Changes in population demography with a larger representation of elderly people have resulted in an increased demand for glaucoma care, services coming under pressure, and the build-up of a significant backlog of patients waiting to be seen for review. Not unreasonably, innovative ways of working using different professional groups in a variety of clinical settings have been suggested. We have developed a novel model with patients being seen in an Ophthalmic Diagnostic and Treatment Centre (ODTC) by members of professions allied to medicine (PAMs – optometry, nursing and orthoptics), using a bespoke electronic patient record (EPR, for clinical findings, visual fields and optic disc imaging) without the physical presence of an ophthalmologist. Clinical advice and quality assurance are provided by a glaucoma specialist consultant ophthalmologist working in a virtual clinic environment.

The aims of this study were to survey the patient experience for those attending the ODTC, their overall impressions of a new system for care, their interactions with the practitioners and the feasibility of providing practitioner support via a specialist in a virtual clinic.

Methods: A QUOTE-type questionnaire survey was administered to patients attending the ODTC. For the purposes of proper comparison with existing patterns of working, a control group was chosen consisting of patients seen within the HES, by non-medical staff, but with ophthalmologists (including consultants with a special interest in glaucoma) available for real-time advice. Thus all patients were seen by PAMs and no patient in person by an ophthalmologist.

Results: 137 consecutive patients provided questionnaire returns. The responses confirmed a high standard of professionalism in practitioner-patient contact for all groups. Essentially patients do not mind where they are seen or by what kind of practitioner as part of their overall package of care. A minority expressed a preference to be seen by an ophthalmologist in person. 55% of the patients seen in the ODTC environment were judged by both the practitioner and the virtual clinic reviewer as suitable for return to the ODTC for their next assessment. 33% of ODTC patients' PAM consultations received input from the virtual consultant. 90% of patients were happy to continue with some care in the ODTC. Practitioners were unanimous in expressing professional satisfaction with ODTC working. Virtual clinic review time per patient averaged less than five minutes.

Conclusion: Patients with glaucoma and ocular hypertension may be seen in the absence of the physical presence of an ophthalmologist by using the skills of members of various professions allied to medicine. Patients find this experience highly acceptable.

Clinical Examination Methods: Progression (Structure and/or Function)

P308 PERIPAPILLARY ATROPHY CHARACTERISTICS IN PATIENTS WITH DIFFERENT FORM OF PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: To define features of the progression peripapillary atrophy in patients with POAG and NTG.

Methods: The retrospective study conducted in ophthalmology department of the Mandryka 2nd Clinical Hospital (Moscow) from April to June 2010. Sixty five patients (106 eyes, average age 64.72 ± 14.16 years) with POAG and NTG were included. All patients were underwent computerized retinotomography.

Results: Statistically significant increase of PPA area in patients with moderate and advanced stages of glaucoma were defined. We determined that supra-nasalis sector in early stage NTG was significant greater than similar in POAG (0.1 and 0.07 respectively; $p < 0.05$), and nasalis and temporalis sectors in moderate stage NTG was significant greater than similar in POAG ($p < 0.05$).

Conclusion: Retinotomography may be proposed as method of calculation PPA area (beta-zone) in glaucoma patients. Observed data dictate necessity for more attention to nasal hemisphere of optic nerve disc in NGT patients. OND of patients with advanced stages of POAG characterized by greater size that may be both independent risk factor of disease and evidence of transformation in the structure of the disc from stage to stage (pathological «flattening effect»).

P309 ABSTRACT WITHDRAWN

P310 THE EFFECT OF PATTERNED SCANNING LASER PHOTOCOAGULATION ON PERIPAPILLARY RETINAL NERVE FIBER LAYER THICKNESS AND OPTIC DISC MORPHOLOGY IN DIABETIC RETINOPATHY

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Background: To determine the effect of patterned scanning laser photocoagulation with short exposure time on retinal nerve fiber layer(RNFL) thickness and optic nerve morphology in patients with diabetic retinopathy.

Methods: In a prospective controlled study, total 84 eyes (53 patients) were included. We measured peripapillary RNFL thickness and cup/disc ratio using optical coherence tomography before and 2 months, 6 months and 12 months after patterned scanning laser photocoagulation in study group and baseline and 6 months and 12 months later in control groups. The relationship between changes of the RNFL thickness and cup/disc ratio and number of laser burns and any other factors were analyzed.

Results: Subjects included 35 eyes for a study group and 49 eyes for a control group. The RNFL thickness of study group changed $-2.90 \pm 27.19 \mu\text{m}$ in 2 month, $+1.57 \pm 13.71 \mu\text{m}$ in 6 months and $+7.36 \pm 11.74 \mu\text{m}$ in 12 months after laser compared to baseline RNFL thickness. In control group, the RNFL thickness changed $+1.23 \pm 10.89 \mu\text{m}$ in 2 months, $-2.65 \pm 10.80 \mu\text{m}$ in 6 months and $-3.02 \pm 11.93 \mu\text{m}$ in 12 months, respectively. However, the changes between the two groups were not statistically significant ($p = 0.45, 0.10, 0.25$). Optic disc morphology such as C/D area ratio and C/D ratio were not changed after patterned scanning laser photocoagulation.

Conclusion: The peripapillary RNFL thickness was not changed in patients with diabetic retinopathy treated with patterned scanning laser photocoagulation with short exposure time. These finding suggests that shorter pulse duration in patterned scanning laser photocoagulation would contribute to less damage in inner retinal layer in patients with diabetic retinopathy.

P311 A MODEL TO PREDICT GLAUCOMATOUS VISUAL FIELD PROGRESSION USING BASELINE CLINICAL DATA

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Background: There is no accepted clinical prediction model to predict the rate of glaucomatous visual field progression. The aim of this preliminary study is to investigate the performance of a systematically developed prediction model for glaucomatous visual field progression using easily available baseline data.

Methods: Open-angle glaucoma patients were consecutively collected from three Dutch hospitals from 2001 to 2003. All patients were treated with topical glaucoma medication at baseline. Baseline data were collected and patients received routine follow-up examinations until 2010. We included 333 eyes of 333 glaucoma patients with at least two reliable visual field examinations during the follow-up period and calculated their rate of progression using the Visual Field Index (VFI). We built a model to predict the VFI rate of progression using a linear regression analysis and univariate pre-selection ($p < 0.1$) of eight candidate predictors. The performance of the final model was investigated using R^2 , the concordance statistic, and calibration plots. Clinical usefulness was assessed with decision curves. The model was internally validated with the use of 200 bootstrap samples.

Results: During a mean follow-up period of 6.2 years, a mean of 5.9 visual fields were performed for each study eye. The mean rate of VFI progression was -1.9% (± 3.4) per year. The final internally validated model contained the following predictors: age (-0.04% per year older), baseline intraocular pressure (IOP) (-2.01% for an IOP > 21 mmHg), and baseline visual field status (-1.24% for moderately and -1.58% for severely affected visual fields). In our population, 10.3% of the observed variation in VFI rates was explained by the model. When the prediction model was used to detect a VFI rate $\leq -3\%$ per year, the optimism-corrected concordance statistic was 0.75.

Conclusion: The rate of visual field progression can be predicted with the use of easily available baseline predictors. The model seems to be clinically useful to indicate subgroups of patients with high rates of visual field progression.

P312 THE TOPOGRAPHIC RELATIONSHIP BETWEEN STRUCTURAL AND FUNCTIONAL RATES OF GLAUCOMATOUS PROGRESSION

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Objective: To evaluate the topographic association between rates of visual field loss and progressive optic disc change in glaucoma.

Methods: The study included 939 eyes of 518 individuals with suspect or established glaucoma followed up for an average of 8.0 ± 4.1 years with annual standard automated perimetry visual field and optic disc stereophotographs. Visual fields were divided into 6 topographic locations according to a map proposed by Garway-Heath et al. The presence and location of progressive optic disc damage was graded by masked assessment of longitudinally acquired simultaneous stereophotographs by 2 graders. Linear mixed models were used to evaluate the relationship between progressive damage on the six optic disc sectors and the corresponding visual field locations sectors.

Results: 169 (18%) of the 939 eyes had progressive optic disc change during follow-up. Eyes that had optic disc progression had a faster rate of change in visual field mean deviation compared to non-progressors (-0.195 dB/year vs. -0.043 dB/year, respectively; $p < 0.001$). Optic disc progression was situated most frequently in the inferotemporal sector ($n=113$), followed by the superotemporal ($n = 72$), superonasal ($n = 51$), inferonasal ($n = 32$), nasal ($n = 29$), and temporal ($n = 26$) sectors. There was a significant relationship between the location of optic disc changes and the location of progressive visual field loss.

Conclusion: Eyes with progressive optic disc damage had faster rates of visual field progression. There was an association between structural and functional localization of glaucomatous progression.

P313 PRIMARY ANGLE CLOSURE: CLINICAL PRESENTATION, SEVERITY AND PROGRESSION IN MALAYS

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Background: Higher prevalence of angle closure and angle closure glaucoma has been reported in Asians especially among Chinese. There is lack of clinical knowledge on angle closure in Malay population.

Methods: A retrospective record review was conducted involving patients diagnosed with primary angle-closure glaucoma (PACG), primary angle closure (PAC) and primary angle-closure suspect (PACS) in two main tertiary hospitals in Kelantan, Malaysia from January 1993 to June 2010, with at least 5 years follow up from initial presentation. The details of initial presentation including sign and symptoms at presentation, presence of acute attack, intraocular pressure (IOP) measured by using Goldman applanation tonometer, visual acuity using Snellen chart, gonioscopic evaluation, slitlamp biomicroscopic finding, initial documentation on vertical cup to disc ratio and Humphreys visual field (24-2 or

30-2) were recorded. The selected cases were rediagnosed based on the current definition of angle closure (Foster et al, 2000). The progression from PACS to PAC or PAC to PACG was based on HVF and VCDR. The severity of PACG was defined based on HODAPP classification. Stepwise multiple logistic regression test was used to determine predictors affecting progression of angle closure in Malays residing in Malaysia.

Results: A total of 200 eyes (100 patients) were included with 3:1 female to male ratio. The mean age at the initial presentation was 61.43 SD 8.42 years old. Majority were asymptomatic with only 47% presented with acute attack. 135 eyes (67.5%) presented with PACG and 91 eyes were in advanced stage with 34% presented with visual acuity worst than 6/60. Fourteen eyes were already blind at initial presentation. Based on stepwise multiple logistic regression, the absence of laser peripheral iridotomy increased the risk of progression to 8.5 times (95% CI; 1.47, 48.51). The improvement of mean deviation of visual field (less negative value) demonstrated protective effect against progression of the disease (OR 0.87; 95% CI 0.83, 0.93).

Conclusion: Primary angle closure is not uncommon among Malays. Majority presented with chronic asymptomatic type of disease and associated with higher risk of blindness. Laser peripheral iridotomy confers protective effect against progression of the disease. Public awareness and early diagnosis is important in prevention of blindness in Malays.

P314 THE CHANGE OF OPTIC NERVE HEAD AND RETINAL NERVE FIBER LAYER AFTER PAN-RETINAL PHOTOCOAGULATION IN PATIENTS WITH DIABETIC RETINOPATHY

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Purpose: *Primary outcome:* To evaluate the change of optic nerve head [ONH] parameters and retinal nerve fiber layer [RNFL] after pan-retinal photocoagulation [PRP] in patients with diabetic retinopathy [DR]. *Secondary outcome:* To study the effect of PRP on macular thickness in diabetic retinopathy. **Patients and Method:** This is a prospective, non-comparative study of 29 eyes from 22 patients with Type 2 Diabetes Mellitus. All eyes were eligible for PRP due to severe non-proliferative DR [NPDR] or proliferative DR [PDR] without pre-existing glaucoma suspected ONH or any ocular diseases affected ONH. After completed ophthalmoscopic examination, PRP was performed in several occasions until considered adequate. Retinal nerve fiber layer and ONH were evaluated with Heidelberg Retinal Tomography version 2.0 [HRT II] and macular thickness was recorded with Optical Coherence Tomography before PRP and at 3,6,12 months after PRP.

Results: There were 12 males and 10 females with the mean age of 51.4 years [range 38-72]. Twenty-two eyes [75.9%] had PDR and 7 eyes [24.1%] had severe NPDR. Among all eyes, there were 5 eyes [17.2%], which clinically significant macular edema was observed at presentation. After PRP, mean cup to disc [C:D] ratio was not significantly change [$p = 0.81$]. The mean RNFL thickness was slightly increased from $0.191 \pm 0.118 \mu\text{m}$ before PRP to $0.198 \pm 0.130 \mu\text{m}$ after PRP at last visit but the difference was not statistically sig-

nificant [$p = 0.69$]. Mean central macular thickness after PRP ($265.08 \pm 71.38 \mu\text{m}$) was significantly greater than before PRP ($235.69 \pm 69.98 \mu\text{m}$) [$p = 0.026$]. Mean foveal thickness was also significantly increased after PRP [$p = 0.04$]. Mean follow-up was 31.2 ± 19.3 weeks.

Conclusion: The RNFL thickness and C:D ratio were not significantly change after PRP measured with HRT II. Macular and foveal thickness was significantly increased after PRP.

P315 RATES OF PROGRESSION OF VISUAL FIELD LOSS IN PRIMARY OPEN-ANGLE AND ANGLE-CLOSURE GLAUCOMA

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Background: To compare the rates of progression (ROP) of visual field (VF) loss in primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG) and to analyze the risk factors associated with increased ROP.

Methods: In a clinic-based, retrospective study, we analyzed the data of all POAG and PACG patients who had more than 5 VFs between 1989 and 2008 and were treated by a single physician. Guided Progression Analysis software which provides the rate of progression (ROP) of Visual Field Index per year was used to assess the rate of VF progression. ROP in POAG eyes was compared with that in PACG eyes. Associations between ROP and risk factors for progression namely age, sex, presence of systemic hypertension and diabetes, severity of VF loss (mean deviation on VF) at presentation, number of anti-glaucoma drugs at last follow-up, number of VF examinations during follow-up, total follow-up duration, mean intraocular pressure (IOP), maximum IOP and IOP fluctuation during follow-up were analyzed using multivariate regression models separately in POAG and PACG eyes.

Results: VFs of 234 eyes of 151 POAG and 146 eyes of 101 PACG patients were analyzed. Mean (\pm standard deviation) age of POAG patients (54.3 ± 12.7 years) was similar ($p = 0.57$) to that of PACG patients (55.1 ± 10.1 years). There were more females (40/101 vs. 34/151, $p = 0.004$) in PACG group. MD at presentation in POAG group (-12.01 ± 8.38 dB) was similar ($p = 0.60$) to that in PACG group (-11.53 ± 8.87 dB). Mean number of anti-glaucoma drugs were similar ($p = 0.82$) in POAG (1.08 ± 0.70) and PACG (1.06 ± 0.94) groups. Mean follow-up was similar ($p = 0.06$) between POAG (7.3 ± 3.4 years) and PACG (6.7 ± 2.5 years) groups. Maximum IOP (20.29 ± 3.60 mmHg vs. 19.49 ± 3.88 mmHg, $p = 0.04$) and IOP fluctuation (2.90 ± 1.23 mmHg vs. 2.62 ± 1.31 mmHg, $p = 0.04$) during follow-up were significantly greater in the POAG compared to the PACG group. The ROP in POAG group was $-1.20 \pm 2.16\%$ per year. ROP in PACG patients was $-1.18 \pm 2.08\%$ per year. There was no difference ($p = 0.93$) in the ROP between POAG and PACG patients. None of the risk factors analyzed were significantly associated with increased ROP in POAG eyes while increasing age ($\beta = -0.03$, $p = 0.04$) and greater number of anti-glaucoma drugs ($\beta = -0.52$, $p = 0.01$) were associated with increased ROP in PACG eyes.

Conclusions: In this clinic-based cohort with a long follow-up, ROP of VF loss in PACG was comparable to that in POAG.

P316 PERFORMANCE OF THE VISUAL FIELD INDEX (VFI) ACROSS THE SPECTRUM OF GLAUCOMA SEVERITY

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Background: The Visual Field Index (VFI) provides an estimate of the severity of visual field (VF) loss and was developed to estimate the rate of change in visual function over time. It ranges from 0% (perimetrically blind) to 100% (normal). The VFI is based on the pattern deviation plot (less sensitive to diffuse loss) and places more weight on central, compared to peripheral VF locations. Early glaucomatous defects, however, typically occur in peripheral locations. The goal of this study was to assess the performance of the VFI across a broad range of VF severity. We hypothesized that while the VFI may show strong correlations with other measures of VF severity overall, it may not be sensitive to early glaucomatous VF loss.

Methods: In this cross-sectional study, visual function was assessed in one eye of 89 participants selected from the Indianapolis Glaucoma Progression Study. All participants had primary open-angle glaucoma based on clinical examination. Participants had at least three reliable (less than 33% fixation losses, false positive and false negative errors) standard automated perimetry tests using the Swedish Interactive Thresholding Algorithm 24-2 program. The data from the third test were used to minimize the impact of learning effects. Each VF was reviewed for quality and VF tests with artifacts were excluded. The VFI, Advanced Glaucoma Intervention Study (AGIS) score, mean deviation (MD), and the number of total (TD) and pattern deviation (PD) points triggered at < 5% and < 1% were derived. Two analyses were performed. 1) The overall association (R^2) between the VFI and each parameter was assessed. 2) The VFs were binned into groups based on 5% VFI intervals. We assessed the outcome of the Glaucoma Hemifield Test (GHT) (borderline outcomes were considered normal), abnormal PSD (< 5% or worse) and the VF status (normal/abnormal; abnormal defined as PSD < 5% or worse or GHT outside normal limits) within each VFI bin.

Results: The overall associations (R^2) between the VFI and each of the parameters were: 0.89 (MD), 0.88 (PD < 1%), 0.84 (AGIS), 0.79 (PSD), 0.73 (PD < 5%), 0.72 (TD < 1%), 0.48 (TD < 5%) (all slopes were significant at $p < .0001$). All VFs in bins with a VFI $\leq 90\%$ had GHTs outside normal limits. 69% (11/16) of VFs in the 91-95% VFI bin, and 11% (6/53) of VFs in the 96-100% VFI bin, had a GHT outside normal limits. All VFs in bins with a VFI $\leq 95\%$ had a PSD < 5% or worse and were abnormal (based on the PSD or the GHT). In the 96-100% bin, 36% (19/53) of VFs had a PSD < 5% or worse, and 38% (20/53) of VFs were abnormal.

Conclusions: The results of this study show that overall, the VFI correlates relatively well with other measures of visual field severity. However, visual fields with VFI values higher than 90% show a wide range of severities on other measures. This reduces the ability of the VFI to detect glaucomatous visual field progression in the early stages of the disease.

Clinical Examination Methods: Other

P317 ABILITY OF RAPD TO DETECT GLAUCOMATOUS OPTIC NEUROPATHY

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Background: In its early and moderate stages, glaucoma often causes asymmetric damage to the two eyes. Such asymmetry should yield a relative afferent pupil defect (RAPD). This is detected relatively simply with a swinging torch test. We investigated the correlation of a detected RAPD with standard automated perimetric indices and retinal nerve fibre thickness (RNFL) as measured by optical coherence tomography (OCT).

Methods: For this prospective observational study, we enrolled 204 consecutive glaucoma patients in a Glaucoma hospital clinic. Exclusion criteria were best corrected visual acuity less than 6/18, chronic miotic therapy, pathological mydriasis, previous intraocular surgery or laser treatment and any ocular or neurological disease affecting pupil reactivity. Inclusion criteria were any type of glaucoma. The demographic profile, best corrected visual acuity (BCVA), intraocular pressure, cupping as noted by 90 D examination, Humphrey field indices and RNFL thickness by OCT were recorded. Patients were examined for RAPD by the swinging torch method and graded as follows: Grade 1 – a weak initial constriction and greater dilatation; Grade 2 – an initial stall and greater re-dilatation; Grade 3 – an immediate dilatation

Results: Forty patients among 204 with glaucoma demonstrated a RAPD. Twenty patients had Grade 1, 13, Grade 2 and 7, Grade 3. The mean age of patients with RAPD (RAPD +ve) was 67.1 ± 10.6 SD, that of 164 patients without RAPD (RAPD -ve) was 67.03 ± 11.8 SD ($p > 0.05$). In the RAPD +ve patients, the mean scores of the study variables such as Mean Deviation (MD), Pattern Standard Deviation (PSD) and RNFL thickness were significantly different ($p < 0.05$) between the RAPD affected and unaffected eyes. The mean MD (-10.91 ± 9.27 vs -3.89 ± 4.99) and RNFL average (64.54 ± 0.1576 vs 82.28 ± 13.01) scores were significantly lower ($p < 0.05$) and the PSD scores (7.45 ± 3.98 vs 3.43 ± 2.88) were significantly higher ($p < .05$) in RAPD affected eyes. The mean BCVA score in the RAPD affected eye was 0.71 ± 0.28 , significantly lower ($p < 0.05$) than unaffected eyes (0.84 ± 0.26). The mean CDR in RAPD affected eyes (0.85 ± 0.08) was significantly higher ($p < 0.05$) compared with the unaffected eyes (0.63 ± 0.16). The IOP score was not significantly different ($p > 0.05$): RAPD affected (15.6 ± 5.16) versus unaffected eyes (14.6 ± 3.59). Similar analyses of these variables in RAPD -ve patients showed no statistically significant differences ($p > 0.05$) between the eyes. The mean inter eye difference of all the variables when compared between the groups was significant ($p < 0.05$). In RAPD +ve patients, the comparison of MD PSD and RNFL between Grade 1 (20 patients) and combined Grades 2 & 3 (20 patients) demonstrated that inter-eye differences increase with increased severity of RAPD and these were statistically significant.

Conclusion: RAPD correlated with the extent of asymmetry

between both functional (visual field indices) and structural (RNFL thickness analysis) glaucoma damage. This might prove useful in screening for glaucoma by health care workers outside eye care.

P318 PECULIARITIES OF THE CICATRIZATION OF INCISION AFTER THE NON-PENETRATING DEEP SCLERECTOMY AMONG PATIENTS WITH GLAUCOMA AND DIABETIC POLYNEUROPATHY

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Background: The risk of resistant glaucoma development is increased in patients with diabetes mellitus, that often leads to the surgery. It is known that vegetative nervous fibres influence on the wound epithelization. Diabetic patients suffer from an early affect of sensitive and vegetative nervous, that can cause a change of epithelization of incision after a non penetrating deep sclerectomy in patients with glaucoma. The aim was to study the cicatrization of incision after the non penetrating deep sclerectomy among patients with glaucoma and diabetic polyneuropathy.

Methods: 22 patients with glaucoma and diabetic polyneuropathy and 27 patients with glaucoma without diabetes mellitus were made the non penetrating deep sclerectomy. Research methods were Corneal Confocal Microscopy, esthesiometry, pupil cycle time, Schirmer, Jones and Norn test.

Results: In patients with glaucoma and diabetic polyneuropathy the epithelization time and the degree of eye inflammation reaction on the non penetrating deep sclerectomy were higher than in patients with glaucoma without diabetes mellitus ($p = 0.007$ and $p = 0.01$). Violations of vegetative innervation were also marked in patients with glaucoma and diabetic polyneuropathy due to an increase of pupil cycle time, decrease of corneal sensitivity, reducing of corneal nervous fibres, and also decrease of

Conclusions: In patients with glaucoma and diabetic polyneuropathy the defeat of vegetative nervous fibres and an increase of epithelization time are noted after the non penetrating deep sclerectomy.

P319 ABSTRACT WITHDRAWN

P320 COMPARISON OF PACHMATE ULTRASOUND, PENTACAM AND RTVue OPTICAL COHERENCE TOMOGRAPHY TO MEASURE CENTRAL CORNEAL THICKNESS

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Background: This is the first study to compare fourier domain optical coherence tomography (FDOCT) with ultrasound and Pentacam.

Methods: In this comparative study, 100 normal corneas of 50 patients with no previous corneal surgery were measured.

Results: The mean central corneal thickness measured by ultrasound was 557.4 microns. The mean by FDOCT was 534.1 and Pentacam was 573.1.

On average FDOCT read 23.3 microns thinner than ultrasound (95%CI: 19.7-26.9). The Bland Altman plot showed a random scatter with FDOCT mostly thinner.

On average Pentacam read 15.73 microns than ultrasound (95%CI: 21.2, 10.2). The Bland Altman plot showed a random scatter with Pentacam mostly thicker.

Conclusion: Accurate measurement of the central cornea is important for the evaluation of patients with glaucoma and those wishing to undergo refractive surgery. This study emphasizes the differences in measurements obtained and that readings should not be used interchangeably.

P321 NAIL BED HEMORRHAGE: A CLINICAL MARKER OF OPTIC DISC HEMORRHAGE IN GLAUCOMA PATIENTS

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Purpose: To find the characteristics of nailfold capillary changes in glaucoma patients and analyze the relation to clinical characteristics of glaucoma.

Methods: Hundred and eight glaucoma patients and 38 controls were enrolled in the study. Eighty six patients were classified as normal-tension glaucoma (NTG) and 22 patients as primary open-angle glaucoma (POAG). All subjects underwent a complete ophthalmic examination and then the subjects were referred to Rheumatology, and underwent a complete physical examination and questioned regarding a history of systemic symptoms. Nailfold capillaroscopy were carried out and analyzed by a single observer in a masked manner. Chi-square and multivariate logistic regression analysis were performed to determine which ocular characteristics were associated with the findings of nailfold capillaroscopy.

Results: In the glaucoma patients, 55.6% showed dilated vessels, 35.2% showed loss of capillaries, and 19.4% showed nail bed hemorrhages by nailfold capillaroscopy. Disc hemorrhage was significantly associated with avascular area (OR, 11.133; $p < 0.001$) and nail bed hemorrhage (OR, 81.592; $p < 0.001$). By multivariate logistic regression analysis, avascular area and nail bed hemorrhage continued to be independently associated with the presents of disc hemorrhages in glaucoma patients. No significant differences of association were found between NTG and POAG.

Conclusions: Nailfold capillaroscopy may give valuable information of some features of glaucoma patients. Nail bed hemorrhage and loss of nail capillaries were strongly associated with the presence of optic disc hemorrhage and the association was stronger with nail bed hemorrhage. No difference were observed between NTG and POAG patients.

P322 CORRELATION BETWEEN THE PRESSURE TO CORNEA INDEX AND BOTH STRUCTURAL AND FUNCTIONAL MEASURES OF GLAUCOMA

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Background: the pressure to cornea index (PCI) was proposed in order to integrate intraocular pressure and central cornea thickness as a single risk factor for glaucoma. The purpose of the study was to correlate the PCI with a structural and two functional measures of glaucoma.

Methods: PCI was calculated for 70 eyes of 36 subjects

(glaucoma and suspects). Cup-to-disc ratio (C/D), mean deviation (MD) and pattern standard deviation (PSD) as recorded by Humphrey automated perimetry (SITA 24-2) were correlated with PCI (Pearson correlation coefficient).

Results: Pearson's correlation coefficient between PCI and C/D was 0.329 (95% IC, 0.099 to 0.526, $p = 0.006$); between PCI and MD was 0.356 (95% IC, 0.126 to 0.549, $P = 0.003$); and between PCI and PSD was -0.215 (95% IC, -0.433 to -0.025 , $p = 0.07$).

Conclusion: In addition to serve as a single risk factor, PCI can be used to stage glaucoma severity or as surrogate biological marker in glaucoma.

P323 THE RELATIONSHIP BETWEEN OCULAR RIGIDITY AND CORNEAL PARAMETERS IN GLAUCOMATOUS EYES

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Background: Ocular rigidity, as described by Friedenwald, is a biometric parameter, which may reflect the stiffness or the elasticity of the eye globe. Corneal hysteresis measurement indicates the biomechanical properties of the cornea. We studied the correlation between ocular rigidity, corneal hysteresis (CH) and central corneal thickness (CCT) in glaucomatous eyes.

Methods: We evaluated the ocular rigidity, CH and CCT in 55 eyes of 55 patients with treated primary open-angle glaucoma (age 38-77 y), with refractive errors/astigmatism between +2.0 and -2.0 dpt and without any previous ocular surgery. Using the Schiotz tonometer, three consecutive measurements with 5.5 g and 10 g weights respectively were obtained from each eye. The mean values were applied on the Friedenwald's diagram, which enables the calculation of ocular rigidity coefficient (ORC). CH was determined by the Ocular Response Analyzer and CCT was measured by an ultrasound pachymeter. ORC, CH and CCT values from one eye of each subject, selected in a randomized order, were compared and statistically analyzed (Pearson's correlation coefficient).

Results: Mean IOP was 16.4 ± 2.5 mmHg. Mean value and standard deviation of ORC, CH and CCT were 0.017 ± 0.006 , 9.3 ± 1.5 mmHg and 531.6 ± 33.7 μ m respectively. We found a statistically strong positive correlation between ORC and CH (correlation coefficient $r = 0.68$, $p < 0.001$). ORC showed a weaker, but significantly positive correlation with CCT (correlation coefficient $r = 0.33$, $p < 0.05$).

Conclusions: In eyes with treated primary open-angle glaucoma CH was significantly associated with the ocular rigidity. Ocular rigidity as a concept may rather express the viscoelastic properties of the eye, than its stiffness or elasticity. CH could be further studied as an indicator for the biomechanical properties of the corneoscleral shell.

P324 COMPARATIVE STUDY OF RETINAL NERVE FIBRE LAYER THICKNESS IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA/HYPOPNEA SYNDROME WITH AND WITHOUT GLAUCOMA

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Purpose: To analyze the quantitative changes in retinal nerve fibre layer (RNFL) thickness, evaluated with spectral-domain optical coherence tomography (OCT), in obstructive sleep apnoea syndrome (OSAS) patients with and without glaucoma.

Material and Methods: Prospective study of 52 eyes of 26 patients with severe OSAS. A comprehensive ophthalmological examination and additional tests was carried out, including RNFL thickness measured with OCT. According to the findings in the visual field and the optic nerve head morphology, the eyes were classified in those with glaucomatous damage and healthy. RNFL thickness was compared between both groups.

Results: Seventeen men and 9 women were included. The average age was 59.65 years. Of 52 eyes, 13 were diagnosed of glaucoma. The average global RNFL thickness in eyes with glaucoma was 311.23 microns whereas in healthy eyes it was 380.36 microns ($p 0.024$). The major difference was found in the inferior sector (90.38 microns in sick eyes opposite to 116.36 microns in healthy, $p 0.151$).

Conclusions: OCT findings has showed differences in RNFL thickness between eyes with and without glaucomatous optic neuropathy in patients with OSAS. The most quantitative difference between healthy eyes and those with glaucoma in early stages was in the inferior quadrant.

Refractive Errors In Relation to Glaucoma: Myopia

P325 THE EFFECT OF MYOPIA ON RETINAL NERVE FIBER LAYER AND GANGLION CELL COMPLEX THICKNESS: AN OPTICAL COHERENCE TOMOGRAPHY STUDY

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Background: To investigate the effect of myopia on RNFL and GCC thickness as measured by ONH (optic nerve head) and GCC (ganglion cell complex) scans of FD-OCT RTVue 100 in normal subjects and in patients with early glaucoma according to Hodapp classification.

Methods: 88 eyes of 88 patients with early glaucoma and 52 eyes of 52 normal subjects were enrolled between March 2010 and December 2010. Each subject underwent a complete ophthalmic examination, including measurement of visual acuity and refraction. The Mean Spherical Error was -3.50 D in the early glaucoma group (range: emmetropic to -9 D) and -3.75 D in the normal group (range: emmetropic to -9 D). Optical Coherence Tomography (RTVue 100, software version A4, 5, 0, 59) was performed by a single operator using GCC, ONH and 3D Disc scans. Associations between RNFL / GCC measurements (obtained with ONH and GCC scan, respectively) and SE were evaluated by linear regression analysis. The potential effect of age on the results was avoided applying age-correction factor. Significance was set at $p < 0.05$ (CI: 95%).

Results: In the early glaucoma group, both GCC and RNFL measurements exhibited no correlation with spherical equivalent (RNFL Average $r = -0.15$ $p = 0.16$; RNFL Superior $r =$

-0.07 $p = 0.52$; GCC Average $r = 0.05$ $p = 0.61$; GCC Superior $r = -0.05$ $p = 0.61$; GLV $r = 0.13$ $p = 0.24$). The thinning in macular and peripapillary regions in myopic eyes has no statistical significance. In the normal group, both GCC and RNFL thicknesses decreased with increasing negative refractive power (RNFL Average $r = -0.31$ $p = 0.026$; RNFL Superior $r = 0.31$ $p = 0.027$; GCC Average $r = -0.39$ $p = 0.004$; GCC Superior $r = -0.43$ $p = 0.001$; GLV $r = 0.37$ $p = 0.007$). No significant correlation was found between RNFL/ GCC parameters and age neither in the normal, nor in the early glaucoma group.

Conclusion: GCC and RNFL measurements (obtained with GCC and ONH scans of RTVue 100) in glaucomatous eyes vary with SE and age, but with no statistical significance: linear regression shows no significant correlation between peripapillary /macular thicknesses and negative refractive power. Therefore, macular and papillary measurements are useful parameters to assess and monitor glaucoma damage in myopic subjects.

P326 TWO-YEAR BIOMETRIC CHANGES IN ADULT URBAN CHINESE. A POPULATION-BASED STUDY

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Purpose: Cross-sectional data consistently suggest that older people tend to have shorter axial lengths and shallower anterior chambers. Biometric differences between older and younger persons are especially pronounced among Chinese. However, due to the limitation of cross-sectional studies, it has not possible to determine whether this is attributable to cohort or aging effects. Therefore, we conducted a study to estimate the 2-year changes in axial length (AL) and anterior chamber depth (ACD) with the IOLMaster among Chinese aged 35+ years in Guangzhou, China.

Methods: Random cluster sampling was used to identify adults aged ≥ 35 years living in the Huanghuagang District of Guangzhou, China. Baseline data were collected in December 2008, and follow up was completed in December 2010. A systematic 50% sample of subjects from the 2008 study underwent measurement of AL and ACD with an IOLMaster (Carl Zeiss Meditec, software version 3.0), utilizing direct digital download of all data. Data in 2008 and 2010 were collected at the identical illumination settings, and with manufacturer-recommended calibration of all instruments.

Results: Among 1817 subjects participating in the 2008 examination, 19 (1.1%) had died, 51 (2.8%) moved away, and 1595 (91.3%) were successfully examined in 2010. Among these, 797 subjects (50%) were selected for biometric testing. After excluding 20 subjects with previous cataract surgery, 777 right eyes were available for analysis. The difference in axial length between baseline (23.63 ± 1.18 mm) and follow up (23.64 ± 1.21 mm) was not statistically significant (paired t test, $p = 0.318$), whereas the ACD at follow-up (3.18 ± 0.39 mm) was significantly shallower than that at baseline (3.20 ± 0.38 mm, paired t test, $p = 0.007$). Linear regression modeling suggested that decreasing ACD was associated with older baseline age ($\beta = -0.001$, $p = 0.044$) but not with sex (0.002 , $p = 0.844$), or change in height ($p = 0.616$) or weight ($p = 0.486$). Lowess curves indicated that the ACD decrease was greatest for persons aged ≥ 60 years.

Conclusions: This study confirms for the first time among

Chinese subjects that shallowing of the ACD with aging is not apparently associated with a decline in AL. The finding of longer AL in younger persons is likely due to cohort effects, with those born more recently having higher myopia prevalence.

P327 DOES THE REFRACTIVE ERROR AFFECT THE SEVERITY OF GLAUCOMA IN PATIENTS WITH NORMAL-TENSION GLAUCOMA? INTRA-INDIVIDUAL, INTER-OCULAR COMPARISON STUDY

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Purpose: To evaluate whether the refractive error affects the difference of inter-ocular glaucoma severity in patients with normal-tension glaucoma (NTG).

Methods: We retrospectively evaluated all glaucoma patients who were diagnosed NTG for the first time in our hospital from March 2006 to September 2009. The patients were divided into 2 groups according to spherical equivalent of both eyes: hyperopia ($> +0.25$ D) and myopia (< -0.25 D). In each group, we investigated relationships between the differences of inter-ocular Humphrey visual field MD (mean deviation) and bilateral differences of ocular parameters, including refractive error, intraocular pressure (IOP), and central corneal thickness (CCT) using multiple linear regression analysis. In addition, the further evaluation was performed in myopic patients who had bilateral NTG with more than 2dB difference of MD.

Results: There were 246 NTG patients (492 eyes, mean age : 58.79 ± 12.87 , 123 male). In hyperopic patients ($N = 102$), there were no statistically significant between inter-ocular differences of MD and bilateral differences of refractive error ($p = 0.25$). However in myopic patients ($N = 109$), univariate analysis showed that bilateral differences of refractive error ($\beta = 1.91$, $p < 0.0001$) and CCT ($\beta = 0.096$, $P = 0.048$) were statistically significant. Bilateral differences of refractive error ($\beta = 1.63$, $p = 0.0003$) also statistically significant with multivariate analysis. Besides in myopic patients who had bilateral NTG with more than 2 dB differences of MD ($N = 55$), bilateral differences of refractive error ($\beta = 1.61$, $p = 0.0249$) were statistically significant with multivariate analysis, either.

Conclusions: In myopic patients with normal-tension glaucoma, bilateral difference of refractive error may affect the difference of inter-ocular glaucoma severity.

Refractive Errors In Relation to Glaucoma: Refractive Surgical Procedures

P328 EFFECT OF PHOTOREFRACTIVE KERATECTOMY ON OPTIC NERVE HEAD TOPOGRAPHY AND RETINAL NERVE FIBER LAYER THICKNESS MEASURED BY HEIDELBERG RETINA TOMOGRAPH 3 (HRT3)

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Purpose: To determine whether photorefractive keratectomy

(PRK) has significant effects in optic nerve head topography parameters and parapapillary retinal nerve fiber layer (RNFL) thickness measured by the Heidelberg Retina Tomograph 3 (HRT3)

Materials and Methods: In this prospective comparative study, optic nerve head topography parameters and parapapillary RNFL thickness were measured in 43 consecutive healthy eyes the day of PRK and 3 months after that by a single trained examiner using HRT3 (Heidelberg Retina Tomograph, Heidelberg Engineering, Germany). Those with standard deviation of $< 30 \mu$ in HRT and refractive error of ≤ -6 diopter were enrolled. Mean age (SD) of the patients was $29.6 \text{ years} \pm 7.5$ (range 20 to 45 years). We compared disc area, linear Cup Disc ratio, cup shape measure, global rim area, global rim volume, RNFL height variation contour, mean RNFL thickness of stereometric parameters and rim steepness temporal/superior, Rim steepness temporal/inferior, cup size and cup depth of Glaucoma Probability Score before and after PRK. Thickness measurements and other parameters provided by the software (version 3.1.2/6035) of the machine before and after PRK were analyzed using the paired Student t test.

Results: Mean refractive error before and after PRK were -4.1 ± 0.62 and -0.32 ± 0.15 respectively. No significant changes occurred in disc area, Linear Cup Disc ratio, cup shape measure, rim area, rim volume in stereometric parameters and rim steepness temporal/superior, rim steepness temporal/inferior, in Glaucoma Probability Score between before and after PRK ($p > 0.05$). However, RNFL height variation contour, mean RNFL thickness, cup size and cup depth changed significantly after PRK ($p < 0.05$).

Conclusions: PRK can affect some optic nerve head and RNFL thickness parameters measured by HRT. Although most commonly used parameters were not changed significantly after PRK but measurements obtained before and after PRK should be used cautiously for future comparisons.

Clinical Glaucoma: Developmental and Congenital Glaucomas

P329 A CASE OF SUBACUTE BILATERAL ANGLE-CLOSURE GLAUCOMA CAUSED BY CONGENITAL PERIPHERAL CORNEAL THICKENING

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Background: Besides four major factors of angle-closure mechanism including relative pupillary block, plateau iris, direct lens block and retro-lenticular pressure, corneal structural disorder uncommonly causes narrow angle. Here we report a case of bilateral subacute angle-closure glaucoma developed in the eyes of congenital limbal thickening.

Case: A 10-year-old girl presented with gradual blurred vision especially in the right eye (RE). Corneal limbal clouding was pointed out in both eyes (BE) after birth, though her visual development was normal. She also had myocardial degeneration, MS+MR, Guillain-Barres' syndrome and hypertrophic scarring. Lipidosis and chromosomal aberrations were ruled

out. Her visual acuity was 20/60 and 20/20, and intraocular pressure was 44 and 32 mmHg in the RE and the left eye (LE), respectively. Corneal limbal haze was observed in BE, while corneal edema as well as neovascularization in the iris was noted in the RE. Gonioscopically, peripheral anterior synechia of 360 degree in the RE, and that of 240 degree in the LE were observed. Ultrasound biomicroscopy revealed prominent inward bulging of corneal tissue corresponding to the region of peripheral haze, as the cause of angle closure. After trabeculectomy, the swollen corneal tissue was ultra-structurally examined, and showed randomly arranged collagen layers with neither cellular infiltration nor vascular invasion.

Conclusion: Though the clinical course of this patient was progressive at the age of 10, the underlying mechanism of angle-closure was presumably due to the peculiar thickening of peripheral corneal tissue, resembling sclerocornea.

P330 CORNEAL FEATURES IN CONGENITAL GLAUCOMA

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Goal: to assess the keratometry and pachymetry of the cornea in children with congenital glaucoma and their impact on tonometry.

Material: 18 children (32 eyes) with congenital glaucoma were examined at age between 6 months and 9 years, 8 boys (45%) and girls -10 (55%). In all cases the data including keratometry, corneal diameter, tonometry, slit-lamp examination. The central thickness of the cornea was assessed by optical coherent tomographer 'Visante'.

Results: in 70 % of cases the congenital glaucoma was of advanced and far-advanced nature, which speaks about the progressive character of the disease.

Comparing the central thickness with keratometry, corneal diameter and intraocular pressure it was noted a paradox increase of central corneal thickness and decrease of keratometry with progression of congenital glaucoma. This was explained by advanced changes in cornea as a result of its stretching and increase in its diameter, that was confirmed also by clinical signs and results of investigations (tears of the descemet membrane, marked oedema and corneal opacifications) The thickness of the central corneal zone was by 3,8% bigger comparing to early and advanced stages of glaucoma (Pic 1 a,b). The mean intraocular pressure was $25,8 \pm 3,7 \text{ mm.}$ and was not correlated with clinical picture. However with disease progression the increase of IOP was noted that can be explained by an increase of thickness of central corneal zone and decrease of keratometry (steep cornea).

Conclusions: As a result of progression of congenital glaucoma and organical changes of the cornea the following features were noted: an increase by 3,8% of central corneal thickness and decrease of keratometric parameters (steep cornea), increase of diameter by its stretching and elasticity of external layer. These changes also influence on tonometry but do not reflect the exact increase of IOP.

P331 CENTRAL CORNEAL THICKNESS IN IRANIAN INFANTILE GLAUCOMA PATIENTS

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Background: Glaucoma remains a major sight-threatening condition in children, accounting for 2.5% to 10% of cases of blindness in this group.³ Noticeably, the glaucoma is much more common in Middle East. We aimed to compare central corneal thickness (CCT) between controlled primary congenital glaucoma (PCG) cases and nonglaucomatous subjects and to investigate the correlation between CCT and intraocular pressure (IOP) in the study population. This is novel because of lack of similar studies in the region.

Patients and Methods: Twenty-three consecutive PCG cases were included in the study. Among patients with strabismus or lacrimal drainage insufficiency, twenty-one aged and sex-matched non-glaucomatous cases without history of previous intraocular surgery or trauma were selected as control group. None of the subjects had clinical corneal edema and all of the patients had a stable controlled IOP at the time of enrollment. Ultrasonic pachymetry and applanation tonometry along with a complete set of ophthalmic examination were performed for all subjects.

Results: Glaucomatous and nonglaucomatous subjects in the study were aged and sex-matched. Entering both eyes of glaucomatous subjects in the analysis, mean CCT was significantly higher than nonglaucomatous subjects ($589.42 \pm 53.44 \mu\text{m}$ vs. $556.14 \pm 30.51 \mu\text{m}$; $p = 0.001$). There was a significant correlation between CCT and IOP ($r = 0.623$, $p < 0.0001$). In one eye per subject re-analysis of data, the mean CCT in the study group was still significantly thicker than non-glaucomatous controls ($587.86 \pm 56.03 \mu\text{m}$ vs. $560.17 \pm 27.17 \mu\text{m}$; $p = 0.04$), and there was a strong correlation between CCT and IOP ($r = 0.630$; $p = 0.001$). In a multiple regression model, number of previous surgeries, number of drugs used and corneal diameter had no effect on correlation between CCT and IOP.

Conclusion: Iranian PCG cases have significantly thicker cornea than non-glaucomatous subjects and this could significantly affect IOP measurement with applanation tonometry. This is contrary to previous reports from other geographic regions and may reflect racial differences in disease nature. Pachymetry should be considered as an essential part of evaluation for PCG.

P332 EVALUATION OF CONGENITAL GLAUCOMA CASES IN A TERTIARY MEDICAL CENTER

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Background: Congenital glaucoma is one important entity causing visual impairment in early years of life. Medical therapy has a limited success rate and surgery is still the primary therapeutic modality. Early diagnosis and treatment and a proper refractive correction with amblyopia therapy are important for an acceptable visual functional outcome.

Methods: A retrospective analysis of 45 eyes of 27 patients

diagnosed as congenital glaucoma had been performed. Corneal diameter, preoperative and postoperative intraocular pressures were measured. The success rates of decreased intraocular pressure after different types of surgical interventions were evaluated.

Results: Sixteen patients were male (59.26%) and eleven patients were female (40.75%); the mean age at the admission was 9.23 ± 16.17 months (range 2 days and 5 years). Eighteen patients (66.67%) had bilateral and nine cases had monocular involvement. The mean intraocular pressure was 30.09 ± 11.14 mmHg (range 10-60 mmHg); the mean horizontal corneal diameter was measured as 12.69 ± 1.71 mm (range 11-18 mm). Five patients had not attended the control examinations and one case with systemic abnormalities had expired during general anesthesia. Thirty four eyes of 21 patients undergone surgical intervention. Some cases had surgeries more than once and 18 goniotomy, 17 trabeculectomy, 8 trabeculotomy and 5 viscotrabeculectomy interventions had been performed. The mean intraocular pressures during the first month, third month of the operation and the last examination had been found as 24.26 ± 9.37 (range 10-46) mmHg, 26.32 ± 8.92 (range 14-48) mmHg and 25.35 ± 11.16 (range 6-42) mmHg consecutively. Corneal abscess in two cases, optic atrophy and phthisis bulbi in one case were observed during the follow up of the cases.

Conclusion: Goniotomy, trabeculectomy, trabeculotomy and viscotrabeculectomy are amongst surgical alternatives for congenital glaucoma cases. Early diagnosis, convenient surgical modality including removal of opacities in optic media and an aggressive amblyopia therapy with good postoperative follow-up care are important factors for the restoration of good visual function.

P333 FACTORS INFLUENCING LONG-TERM VISUAL OUTCOME OF CHILDHOOD GLAUCOMA

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Purpose: To evaluate factors influencing long-term visual outcome of childhood glaucoma treated intraocular pressure (IOP) reduction with surgery and amblyopia treatment with occlusion therapy.

Methods: Retrospective review of 24 children (35 eyes) treated for childhood glaucoma at a single center.

Results: Age at diagnosis was 149.5 ± 123.7 days, and follow-up was for 7.9 ± 3.3 years. Final IOP was 14.7 ± 4.1 mmHg. Final best-corrected visual acuity (BCVA) was $\geq 20/40$ in 13/36 eyes (36.1%), and $\geq 20/50$ in 17/36 eyes (47.2%). C/D ratio was found to be associated with final log MAR BCVA (Spearman's $\rho = 0.412$, $p = 0.014$). Eyes with anisometropia of 1.5 diopters or larger were found to have significantly worse final BCVA than eyes without anisometropia ($p = 0.001$). Age at diagnosis, type of glaucoma, initial corneal diameter, percentage of time of poor IOP control, additional surgery requirement, final IOP, presence of secondary strabismus, myopia or astigmatism were not associated with final visual outcome. On multiple linear regression analysis, presence of anisometropia was the only factor found to be significantly associated with poor visual outcome.

Conclusion: Anisometropic amblyopia is the leading factor associated with decreased vision in childhood glaucoma with well-controlled intraocular pressure.

P334 THE CLINICAL EXPERIENCE AND SURGICAL OUTCOME IN TREATING PATIENTS OF PHACOMATOSIS PIGMENTOVASCULARIS WITH GLAUCOMA AT A TERTIARY EYE CARE CENTRE

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Background: The term “phacomatosis pigmentovascularis” (PPV) is used to describe the association of a vascular nevus with an extensive pigmentary nevus. It is a combination of oculodermal melanocytosis and Sturge-Weber syndrome. Glaucoma is seen in 10% of the patients with oculodermal melanocytosis. It is estimated that glaucoma affects 30% of patients with Sturge-Weber syndrome. The aim of this study is to describe the clinical experience and surgical outcome in treating the patients of phacomatosis pigmentovascularis with glaucoma at a tertiary care centre.

Methods: Retrospective analysis of the records of 24 patients presenting with glaucoma in phacomatosis pigmentovascularis was done and clinical manifestation and surgical results were analyzed. A total of 40 eyes were analyzed. The surgery was considered a complete success when the IOP was less than 21 mmHg. All patients were examined 1, 2, and 3 days after surgery, followed by examination in the office at the end of 1, 3, and 6 weeks and at every 3 months thereafter.

Result: Median age of patients was 17 months (0 – 252 months, range). 62.5% of patients presented in less than 24 months of age. The distribution between males and females was in the ratio of 1:1. The children presented with enlargement of eyeball in 29.1% (n = 7) of cases, whitening of the cornea in 20.8% (n = 5), epiphora in 12.5 % (n = 3). All the patients presented with a facial hemangiomas and ocular melanosis. Pigmentary nevi over the body were recorded in 100% of patients. Seizures were seen in 16.6% (n = 4). The mean IOP at the time of presentation was 26.47 ± 9.23 mmHg (10 – 49 mmHg, range). 27 eyes underwent surgical management and 4 eyes underwent transscleral cyclophotocoagulation at our center. Five eyes were continued on medical therapy. The IOP in cases undergoing surgical management at our centre reduced from 24.61 ± 5.52 mmHg to 11.80 ± 5.31 mmHg ($p < 0.001$). The mean corneal diameter was 13.21 ± 0.99 (range, 11-16). Preoperative corneal edema was noted in 76.9 % (n = 20) of patients. Persistent post operative corneal edema was noted in 7.6 % (n = 2). Post-operatively 2 eyes had shallow anterior chamber, 6 cases were noted to have hyphaema, 1 case had Descemet's detachment and 1 case had choroidal detachment. The success probability was 95% at the end of 84 months in case of patients who were managed by Incisional surgery.

Conclusions: Phacomatosis pigmentovascularis is a condition with extensive cutaneous vascular malformation and Pigmentary nevi. It is often associated with congenital glaucoma. The management of glaucoma is challenging in these cases and surgical option in the form of combined trabeculotomy and trabeculectomy is safe and effective.

Clinical Glaucoma: Ocular Hypertension and Primary Open-Angle Glaucoma

P335 OCULAR PERFUSION PRESSURE IN PATIENTS WITH EARLY PRIMARY OPEN-ANGLE GLAUCOMA AND OCULAR HYPERTENSION

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Background: Blood flow in the tissues of the body depends on the perfusion pressure, which represents the difference between mean arterial pressure (MAP) and venous pressure (VP). Ocular VP should be minimally higher than intraocular pressure (IOP) in conditions of adequate blood circulation. For calculating the average perfusion pressure (AVP) of the eye, one can consider VP as equal to IOP. Legality of this was confirmed in several studies. Thus: $AVP = 2/3$ [diastolic AP + $1/3$ (systolic AP – diastolic AP)] – IO In this study assessed perfusion pressure, calculated with systemic arterial pressure and Maklakov IOP, calculated with nomogram devised by A.P. Nesterov, M.B. Vurgaft, B.I. Vagin.

Methods: In accordance with the purpose and objectives of the study we conducted a comprehensive clinical examination on 55 patients with ocular hypertension, 110 eyes, 55 patients with early primary open-angle glaucoma (POAG), 79 eyes and 55 clinical healthy people, 110 eyes (control group) in design of cross-cohort comparative study. Of whom 82 men and 83 women. The average age of patients with ocular hypertension was 54.6 ± 13.7 , with early POAG 62.0 ± 9.5 , in control group – 56.3 ± 12.2 years. Observation period is 2 years. Results of clinical studies performed using SPSS 11.5. comparison of samples was performed using anova, the scheffe test. For statistical significance was accepted level of 0.05.

Results: Indicators of average ocular perfusion pressure in patients with ocular hypertension 44.94 ± 5.35 mmHg and early POAG 45.04 ± 5.38 mmHg is lower than in control group 47.65 ± 5.06 mmHg ($p < 0.001$). interest is the study not only mean perfusion pressure and diastolic perfusion pressure of the eye. Diastolic perfusion pressure of the eye in patients with ocular hypertension 62.36 ± 7.35 mmHg and patients with early stage POAG 60.49 ± 6.73 is lower than in control group 64.35 ± 6.43 mmHg ($p < 0.001$). Mean perfusion pressure and diastolic perfusion pressure of the eye depends on the level IOP, which in turn is correlated with the thickness of the cornea. In this regard, we have adjusted the figures tonometry of central corneal thickness (CCT) using the following formula: corrected IOP = Index Tonometry – $(CCT - 545) / 50 * 2.5$. Diastolic perfusion pressure of the eye, after correction of the results of tonometry in patients with early stage POAG 60.40 ± 6.61 mmHg is lower than in patients with ocular hypertension 63.13 ± 7.92 mmHg and in control group 64.14 ± 6.54 mmHg ($p < 0.002$). It should be noted that this formula is designed for converting IOP for Goldmann tonometry and can not be fully correct for the conversion level IOP measured by Maklakov tonometer. The very existence of the relationship CCT and IOP difficult, as evidenced by recent studies. However, the diastolic ocular perfusion pressure important differential diagnostic criterion for hyperten-

sion and early POAG eyes only when taken into account the correction of IOP on the thickness of the cornea.

Conclusions: Ocular perfusion pressure in patients with ocular hypertension (63.13 ± 7.92 mmHg) do not have significant differences from those in the control group (64.14 ± 6.55 mmHg) due to higher levels of diastolic blood pressure and with only the adjustment of the level IOP of central corneal thickness. In primary open-angle glaucoma at an early stage there is a decrease of ocular perfusion pressure (60.40 ± 6.61 mmHg).

P336 RANDOMIZED CLINICAL TRIAL OF THE EFFICACY AND SAFETY OF PRESERVATIVE-FREE TAFLUPROST AND PRESERVATIVE-FREE TIMOLOL IN PATIENTS WITH OPEN-ANGLE GLAUCOMA (OAG) OR OCULAR HYPERTENSION (OHT)

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Background: Prostaglandin analogs are first-line IOP-lowering therapy in patients with OAG and OHT. Most topical ocular hypotensives contain the preservative benzalkonium chloride, which may be associated with decreased ocular tolerability in some patients. We compared the efficacy and safety of tafluprost, a preservative-free (PF) prostaglandin analog, with PF timolol.

Methods: Randomized, double-masked, Phase III clinical trial (NCT01026831) in patients with OAG and OHT. After discontinuation and washout of existing ocular hypotensive treatment, patients who had IOP ≥ 23 and ≤ 36 mmHg in at least 1 eye at the 0800 hr time point were randomized 1:1 to 12 weeks of treatment with either PF tafluprost (PF TAF) 0.0015% or PF timolol (PF TIM) 0.5%. IOP was measured 3 times during the day (0800, 1000, 1600 hrs) at baseline and week 2, 6, and 12. The primary hypothesis was that PF TAF would be non-inferior to PF TIM in IOP change from baseline at all visits and time points (9 time points). The study was powered for a non-inferiority margin of 1.5 mmHg.

Results: A total of 643 patients were randomized and 618 completed (PF TAF = 306, PF TIM = 312). Baseline IOPs ranged from 23.8–26.1 mmHg in the PF TAF group and 23.5–26.0 mmHg in the PF TIM group. IOPs at the 12-week visit ranged from 17.4–18.6 mmHg for PF TAF and 17.9–18.5 mmHg for PF TIM. At all 9 time points, the upper limits of the 2-sided 95% CIs for the difference between treatments in IOP-lowering were less than the pre-specified non-inferiority margin; at 4 of the 9 time points, the upper limits of the CIs were < 0 , in favor of PF TAF. Similar percentages of PF TAF and PF TIM patients reported ocular pain/stinging/irritation (4.4% vs. 4.6%) and pruritus (2.5% vs. 1.5%). The percentages of PF TAF and PF TIM patients reporting conjunctival hyperemia were 4.4% vs. 1.2% (nominal $p = 0.016$).

Conclusions: The IOP-lowering effect of PF tafluprost was non-inferior to that of PF timolol. PF tafluprost is an efficacious and generally well-tolerated ocular hypotensive agent.

P337 AN UNUSUAL PRESENTATION OF JUVENILE OPEN-ANGLE GLAUCOMA IN A CHINESE GIRL: A CASE REPORT

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Background: To report a case of juvenile open angle glaucoma (JOAG) with an unusual presentation.

Methods: Case report

Results: A healthy 19-year-old Chinese girl with high myopia presented with blurring of both vision and a mild headache for 4 months. Best corrected visual acuities (BCVA) at presentation were HM OD and 6/60 OS. IOP was 44 mmHg OD and 42 mmHg OS. Both angles were open (Shaffers Grade IV). Both optic discs were fully cupped, with collateral vessels on the left disc. Perivascular sheathing of retinal vessels were seen in both eyes. No signs of uveitis were detected in either eye. There was advanced bilateral visual field loss with markedly reduced RNFL thickness on OCT. The optic disc vessels did not leak on Fundus Fluorescein Angiography. Myocillin gene screening failed to detect any possible mutation. However, substitution of G to A at IVS2 730+35 was found. The role of this polymorphism in susceptibility of JOAG is not known. There was no evidence of any systemic disease. After the IOP was controlled with augmented trabeculectomy, both BCVA improved to 6/12OD, 6/9OS.

Conclusions: Optic disc collaterals and retinal vessel sheathing are rarely documented in cases of primary glaucoma. Their presence in this case of JOAG may be due to chronic retinal ischemia from long-standing high intraocular pressure.

P338 THE EFFICACY AND SAFETY OF ADDING A BRINZOLAMIDE/TIMOLOL MALEATE FIXED COMBINATION TO PROSTAGLANDIN MONOTHERAPY

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Background: Prostaglandins are the most common first-line treatment for the reduction of intraocular pressure in patients with ocular hypertension or primary open-angle glaucoma. Despite the ocular hypotensive effect of prostaglandins, some patients require additional IOP-lowering therapy to reach target intraocular pressure. Recently, the fixed combination of brinzolamide/timolol received regulatory approval in the European Union. However, information on the adjunctive use of brinzolamide/timolol fixed combination in addition to a prostaglandin is lacking. The purpose of this study was to evaluate the efficacy and safety of adding brinzolamide/timolol fixed combination as a single agent to prostaglandin monotherapy in uncontrolled glaucoma patients.

Methods: In this prospective, open-label study, subjects at 5 centers in Germany received brinzolamide/timolol fixed combination in addition to their current prostaglandin monotherapy. Eligible subjects must have been receiving prostaglandin monotherapy for at least 4 weeks and have demonstrated a need for further reduction in intraocular pressure, which had to be ≥ 20 and ≤ 35 mmHg in at least 1 eye while on prostaglandin monotherapy. Enrolled subjects continued their prostaglandin monotherapy and were asked to use brinzolamide/timolol fixed combination twice daily in the

study eye(s) for 12 weeks. At baseline, week 4, and week 12 visits, intraocular pressure and safety (slit lamp, visual acuity) evaluations were performed in study subjects. Study subjects completed a solicited symptom survey at both baseline and week 12 visits to evaluate ocular discomfort (pain, blurriness, stinging, gritty feeling, and redness) pre- and post-treatment. Treatment success, defined as subjects with at least a 1 mmHg decrease in intraocular pressure from baseline, was evaluated in subjects who completed the study.

Results: Forty-seven subjects, out of 48 subjects enrolled, completed the study. Following 12 weeks of adjunctive brinzolamide/timolol fixed combination treatment, mean intraocular pressure at baseline decreased by an additional 24.4%, from 22.1 mmHg to 16.7 mmHg ($p < .001$; 95% CI: 15.9-17.5 mmHg). There were no differences in the solicited symptom surveys administered pre- and post-treatment ($p \geq .08$). Treatment success was achieved in 97.9% of subjects following 12-week use of brinzolamide/timolol fixed combination in adjunct to prostaglandin monotherapy. There were no significant safety findings in any study subject.

Conclusions: This study demonstrated that brinzolamide/timolol fixed combination may be safely added as an adjunct to prostaglandin monotherapy and can provide further significant intraocular pressure reduction in uncontrolled patients with ocular hypertension or primary open-angle glaucoma. The addition of brinzolamide/timolol fixed combination to prostaglandin monotherapy provided an additional 24% reduction in intraocular pressure when compared to prostaglandin monotherapy.

P339 CORNEAL HYSTERESIS (CH) AND CORNEAL RESISTANCE FACTOR (CRF) IN INTRA-OCULAR HYPERTENSION AND OPEN-ANGLE GLAUCOMA, VERSUS NORMAL EYES

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Purpose: To compare mean values of corneal hysteresis (CH) and corneal resistance factor (CRF) measured by Ocular Response Analyzer (ORA) in intra-ocular hypertension (IOHT), open angle glaucoma (OAG) and normal subjects (NS), and to analyze correlations, reliability and age influence.

Methods: Comparative study of 275 eyes from 145 subjects, divided in three groups: 64 IOHT, 46 OAG and 165 control patient eyes (NS). Following variables were compared: Goldmann applanation tonometry (GAT), central corneal thickness (CCT), and ORA derived parameters including: CH, CRF, Goldmann correlated intra-ocular pressure (IOPg), and corneal compensated intra-ocular pressure (IOPcc). Statistical analysis used non-parametric tests and significant p value < 0.05 .

Results: The highest mean CH was found in the NS group (10.2 ± 1.5), compared to IOHT (9.6 ± 2) and OAG (9.2 ± 1.8). The highest mean CRF was observed in IOHT group (10.9 ± 2.1), compared to NS (10.1 ± 1.6) and OAG (9.9 ± 1.5). CH, CRF and CCT are well correlated with each other, whatever the group. CH is correlated with IOPcc and not with IOPg and GAT; inversely for CRF. In all groups, there is a good reliability between CH and CRF ($r = 0.49$ to 0.77) and an strong reliability between IOPcc, IOPg and GAT ($r = 0.5$

to 0.8). Whatever the group, CH and CRF present no influence of age, that confirms results of previous study. IOPcc is independent of CCT, strongly correlated (negatively) with CH, and statistically different between the three groups, IOHT, OAG and NS, results in agreement with previous published data. CH mean value is lower in OAG eyes, and statistically different compared to IOHT and NS, but there is an overlap of values between groups.

Conclusions: ORA derived corneal biomechanical parameters are not influenced by age. IOPcc is independent of CCT and seems to be a good estimation of intra-ocular pressure. CH and CRF significantly differ between OAG and normal eyes and appears to be useful for an earlier diagnosis of glaucoma.

P340 QUANTITATIVE MEASUREMENT OF MACULAR GANGLION CELL COMPLEX THICKNESS BY SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY

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Background: Glaucoma is characterized by loss of retinal ganglion cells and their respective axons, which comprise the retinal nerve fiber layer (RNFL) on pathologic examination. The time domain optical coherence tomography (TD-OCT) has proven to be useful for measuring circumferential RNFL for glaucoma diagnosis. The spectral domain OCT (SD-OCT) with higher resolution and scan speed compared with the TD-OCT, enables quantitative measurement the macular ganglion cell complex (GCC), which defined as the combination of the nerve fiber, ganglion cell, and inner plexiform layers, and that contain, respectively, the axons, cell bodies, and dendrites of the ganglion cells. In this study, we evaluated the value of SD-OCT for glaucoma detection by measuring GCC thickness.

Objective: To compare the macular GCC thickness measured with SD-OCT (RTVue-100) between normal subjects and glaucomatous patients, and evaluate the correlation between GCC thickness and RNFL thickness or visual field (VF) index.

Methods: A total 41 eyes of 41 normal subjects and 99 eyes of 61 primary open-angle glaucoma patients were enrolled in the study. All the subjects underwent RTVue-100 and TD-OCT (Stratus OCT) measurements of macular GCC thickness and peripapillary RNFL thickness respectively, and VF examination. The measurements of GCC parameters (GCC-Avg, GCC-Sup and GCC-Inf) were compared between normal subjects and glaucomatous patients. The correlations between GCC thickness and RNFL thickness, and between GCC thickness and mean deviation (MD) of VF, were evaluated by linear regression analysis.

Results: The average thickness of GCC-Avg, GCC-Sup and GCC-Inf in normal subjects was (97.16 ± 4.82) μm , (97.22 ± 5.19) μm and (97.12 ± 5.18) μm respectively. The measurements of the three GCC parameters were significantly different between normal subjects and preperimetric and early stage glaucoma patients ($p < 0.01$), and also between each of the early, moderate and severe glaucoma patients. There were significant correlations between GCC-Sup, GCC-Inf, or GCC-Avg and RNFL-Sup, RNFL-Inf, or RNFL-Avg in all study eyes, and Pearson's correlation coefficient were 0.802 , 0.825 , 0.856 respectively ($p < 0.01$). Significant correlations between MD and GCC-Avg in glaucomatous patients was

found with Pearson's correlation coefficient of 0.601 ($p < 0.01$).
Conclusions: SD-OCT can quantitatively measure and differentiate the GCC thickness between normal subjects and glaucomatous patients. The GCC thickness gradually decreases with the development of POAG, and shows the well correlation with visual field defect and RNFL thinning.

P341 THE ANALYSIS OF RETINAL NERVE FIBER LAYER THICKNESS IN PATIENTS WITH OCULAR HYPERTENSION AND OPEN-ANGLE GLAUCOMA

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Background: We aimed to compare the analysis of retinal nerve fiber layer (RNLF) thickness from the patient with ocular hypertension (OHT) and open angle glaucoma (OAG) with the analysis in normal population.

Methods: The 167 eye of 87 subjects were examined after pupillary dilatation with optical coherence tomography (Stratus OCT, model 3000). There were 3 groups; OHT group 1 ($n = 36$), OAG group 2 ($n = 85$), control group, group 3 ($n = 46$). The results of RNLF thickness (mean, superior, inferior, nasal, temporal) were recorded and compared statistically.

Results: There was no statistically significant difference between groups at demographical data of the patients. Central corneal thickness (CCT) was $577.7 \pm 24.8 \mu$ in group 1 where as $557.0 \pm 34.6 \mu$ in group 2 and $541.8 \pm 32.3 \mu$ in group 3. The measurement of CCT was significantly thicker in group 1 then group 2 and 3 ($p < 0.05$). The results of RNLF thickness (mean, superior, inferior, nasal, temporal) were 103.1 ± 9.3 , 124.3 ± 15.8 , 134.6 ± 14.5 , 85.4 ± 19.6 , $67.9 \pm 11.8 \mu$ respectively in group 1, where as 84.9 ± 17.0 , 101.5 ± 25.6 , 107.8 ± 26.0 , 67.8 ± 18.9 , $61.1 \pm 16.6 \mu$ in group 2 and 98.3 ± 11.3 , 117.3 ± 25.6 , 127.9 ± 24.1 , 77.2 ± 16 , $66.2 \pm 11.4 \mu$ in group 3. Although there was no statistically significant difference between group 1 and group 3 at the mean and all quadrant results. There was a significant difference between group 2 with group 1 and group 3 at all quadrants except temporal quadrant ($p < 0.001$).

Conclusion: RNLF thickness analysis with Stratus OCT is an effective and reliable method in detection and evaluation of glaucoma patients. It can provide a significant contribution to other diagnostic methods.

P342 THE RELATIONSHIP BETWEEN CENTRAL CORNEAL THICKNESS AND RETINAL NERVE FIBER LAYER ANALYSIS IN GLAUCOMA PATIENTS

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Background: We aimed to evaluate the relationship between the analysis of retinal nerve fiber layer (RNLF) thickness and central corneal thickness (CCT) in glaucoma patients.

Methods: Forty-seven glaucoma patients were examined after pupillary dilatation with optical coherence tomography (Stratus OCT, model 3000). The results of RNLF thickness (mean, superior, inferior, nasal, temporal) were recorded and compared statistically.

Results: There was a positive correlation between RNLF thickness (mean, superior and inferior quadrant) and CCT measurements in statistical analysis, but the degree of cor-

relation was weak. There was no significant correlation at other quadrants (nasal and temporal).

Conclusion: There was a weak correlation between the analysis RNLF thickness and CCT in this study.

P343 DOES THE DECREASE OF THE IOP LEAD TO AN IMPROVEMENT OF VISUAL FIELD DEFECTS IN GLAUCOMATOUS OPTIC NEUROPATHY?

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Background: To value the impact of a decrease of the intra-ocular pressure on the evolution of the glaucomatous optic neuropathy.

Methods: We achieved a survey of cohort carrying on 46 patients having a POAG. The estimated parameters were the IOP and the Mean Defect (MD) on the automated visual field. A first assessment has been done and then after 12 months repeated while all the patients had got drops to decrease the pressure. The levels of decrease pressure have been calculated in relation to a therapeutical target pressure of less twenty percent (-20%) of the PIO of beginning The MD has been analyzed according to the level of the decreased pressure.

Results: The sample counted 46 patients of which 20 men and 26 women which represents respectively 43.5% and 56.5%. The ratio was 1.3 women for 1 man. The middle IOP for the entire sample during the survey was 18.6 mmHg for the right eye and 18.4 mmHg for the left eye. The average of the MD was -0.26 dB for the right eye and -6.82 dB for the left eye. A decreased pressure over 20% in the right eye drags an improvement of the MD in 33.3% of the cases and in 50% of the cases, stabilization. In the left eye, the values were respectively 28.1% of improvement and 31.3% of stabilization.

Conclusion: It is evident from this survey that the decrease of the order of 20% of the IOP is necessary for the improvement of the level of visual field defects among glaucomatous people.

P344 ABSTRACT WITHDRAWN

P345 NUTRITION AND EYE HEALTH: NUTRIGENETIC STUDY IN PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: to study the relationship between several genetic polymorphisms and primary open-angle glaucoma, and its possible modulation by diet in order to establish new diagnostic and therapeutic strategies for the prevention of glaucomatous blindness.

Method: we carried out a case-control study of 200 subjects, matched by age and sex, and classified into 2 groups: 1) glaucoma group (GG, $n = 100$), 2) control group (CG, $n = 100$). DNA was obtained from a blood sample of each patient by the phenol-chloroform method. The study of genetic polymorphisms (RBP1 rs176990 and rs190910, SLC23A1 rs10063949, SLC23A2 rs1279683) was performed by means

of the TaqMan allelic discrimination technique, using a Real-Time thermalcycler (7900HT Fast Real-Time PCR, Applied Biosystems).

Results: the genotypes distribution in the glaucoma patients was as follows: RBP1-rs 176990: TT = 26.7%, TG = 40%, GG = 33.3%; RBP1-rs 190910: AA = 20%, AT = 52%, TT = 28%; SLC23A1-rs 10063949: CC = 24%, CT = 32%, TT = 44%; SLC23A2-rs 1279683: AA = 25%, AT = 29.2%, TT = 45.8%. In controls was: RBP1-rs 176990: TT = 14.8%, TG = 52.5%, GG = 32.8%; RBP1-rs 190910: AA = 14.5%, AT = 53.2%, TT = 32.3%; SLC23A1-rs10063949: CC = 21%, CT = 40.3%, TT = 38.7%; SLC23A2-rs 1279683: AA = 20.3%, AT = 45.8%, TT = 33.9%.

Conclusions: the polymorphisms studied in RBP1 and SLC23A1 genes are not associated to glaucoma, because of genotypic proportion of it was similar in both groups. The genotypes distribution of the polymorphism studied in SLC23A2 gene was different in glaucoma group respect to control group, so this polymorphism might be related to the glaucomatous optic neuropathy.

P346 ABSTRACT WITHDRAWN

Clinical Glaucoma: Risk Factors

P347 ASYMMETRY OF RIGHT-LEFT EYE CENTRAL CORNEAL THICKNESS IN GLAUCOMA

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Background: Recent studies have shown that thinner corneas are associated with larger and deeper optic disc cups. The purpose of this study is to assess whether the difference of corneal pachymetry between either eye in the same patient is a risk for developing asymmetrical optic disc cups.

Methods: Seventy one patients with an established diagnosis of glaucoma were enrolled in this cross sectional observational study. Ultrasound corneal pachymetry was done to measure central corneal thickness (CCT) in the right-left eyes of the enrolled patients. The average of ten CCT measurements were taken for each eye. The differences between right-left eyes were compared to cup/disc (C/D) ratios assessed clinically by slit lamb biomicroscopy. CCT measurements were analyzed for every 10 microns of difference between both eyes of the same patient. Asymmetrical C/D ratio was considered significant when the difference of 0.2 or more was found between either eye of the same patient. Results were considered statistically significant at 95% confidence interval.

Results: A positive correlation exist between the right-left eye CCT asymmetrical measurements and the corresponding asymmetry in C/D ratios, $p = 0.03$. This was only significant, $p = 0.047$, when assessing differences at more than 10 microns. At that point the odd ratio for obtaining an asymmetrical cup/disc ratio difference of 0.2 or more was 4.875

Conclusion: CCT asymmetry of more than 10 microns between right-left eye in the same patient exposes the patient to a high probability of developing asymmetrical cupping of the optic nerve head.

P348 THE INCREASED LEVEL OF CIRCULATING AND FUNCTIONING TREG LYMPHOCYTES CORRELATES WITH VISUAL FIELD RATE OF PROGRESSION IN PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: The aim of our study is to analyze regulatory T-cells (CD4⁺ CD25⁺ FOXP3⁺) and to test possible correlation with disease progression in patients affected by primary open-angle glaucoma (POAG) and age-matched controls.

Methods: 18 patients affected by POAG (14 males, mean age: 75 ± 9 yrs) and 15 age-matched controls (10 males, mean age: 76 ± 8 yrs) with negative history for neurodegenerative, autoimmune diseases, cancer, viral infection were selected for the study. Disease progression was estimated in glaucoma patients by retrospectively measuring visual field deterioration (24/2 SITA standard, Humphrey Field Analyzer) over a 5-year interval (at least 2 fields / year). Rate of field progression was calculated by (a) regression vs time of MD as measured by Glaucoma Damage Probability Trend in GMS3 software and (b) regression vs time of the GHT clusters mean sensitivity. Upon enrolment, whole blood was sampled from each patient. Flow cytometric analysis was used to determine the CD4⁺ CD25⁺ FOXP3 lymphocyte population. After magnetic cell separation (MACS) of CD4⁺ CD25⁺ (Tresp) and Treg cells, the suppression function of Tregs was assessed using the *in vitro* suppression test (Treg suppression Inspector, Miltenyi Biotec).

Results: The median value of Tregs (%) in POAG patients was 5.55 and 4.40 in controls. The Mann Whitney Test showed a significant difference ($p = 0.027$) between the two groups. No difference in the suppression activity of Tregs has been noted between the POAG and control groups (88 and 94% of suppression in the 1:1 co-culture, respectively). MD rate of progression (mean \pm st. dev) was 0.8 ± 0.7 dB /year in glaucoma patients. The rate of MD progression was significantly correlated with the % Tregs in the individual patients ($r = 0.574$, $p < 0.05$).

Conclusions: Patients with POAG (a) express a higher amount of Treg (CD4⁺CD25⁺FOXP3) than age-matched controls, (b) the Tregs maintain their suppressive activity and (c) the Tregs level correlates with the 5-year visual field rate of progression

P349 EVALUATION OF OCULAR RISK FACTORS RELATED TO ASYMMETRIC VISUAL FIELD DEFECTS IN NORMAL-TENSION GLAUCOMA

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Purpose: To evaluate ocular risk factors related to asymmetric visual field defects in normal-tension glaucoma (NTG).

Methods: We retrospectively evaluated 92 NTG patients (184 eyes) with asymmetric visual field defects; these patients were classified as having more affected eye (ME) group or less affected eye (LE) group. The differences between ME

and LE based on the intra-individual comparison were assessed with several ocular risk factors such as best corrected visual acuity, refractive error, intraocular pressure (IOP), the number of glaucoma medications, disc hemorrhage, central corneal thickness, zone β of peripapillary atrophy (PPA), and disc size. All subjects were divided into two groups according to the severity of bilateral mean deviation (MD, Δ 6dB) and evaluated.

Results: The MD was -11.2 ± 6.5 in the ME group, and -5.9 ± 5.4 in the LE group ($p = 0.00$). The optic disc size was 2.62 ± 0.8 in the ME group, 2.48 ± 0.5 in the LE group ($p = 0.00$), and there were no statistically significant differences in the other factors. Regarding the difference in the MD, the optic disc size was statistically significant in the less different group, and the angle of PPA was statistically significant in the more different group ($p = 0.00$ and $p = 0.01$, respectively).

Conclusions: The optic disc size is a risk factor related to visual field defects in the ME group and the less affected patients, and the PPA is a risk factor, thought to be associated with ischemia, related to visual field defects in the more affected patients with asymmetric normal-tension glaucoma.

P350 RISK FACTORS FOR PRIMARY OPEN-ANGLE GLAUCOMA IN CENTRAL SOUTH KOREA: THE NAMIL STUDY

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Background: To investigate the risk factors of primary open-angle glaucoma (OAG) in the Namil study.

Methods: Seventy five eyes with OAG and 2813 control eyes of Namil study participants were included in analysis. Univariate and multivariate analysis were performed using generalized linear mixed models (GLIMMIX), to identify the ocular factors and systemic factors associated with OAG. Subgroup analysis were performed for normal-tension (IOP ≤ 21 mmHg) OAG and high-tension (IOP > 21 mmHg) OAG. Factors associated with OAG patients as a whole and a subgroup of normal-tension OAG and high-tension OAG patients, were identified and their odds ratio (OR) were calculated.

Results: Older age, history of diabetes mellitus and hypertension and intraocular pressure (IOP) differed between OAG patients and controls in univariate analysis. Multivariate analysis using GLIMMIX demonstrated that older age (OR = 1.032 [95% confidence interval (CI), 1.002 – 1.063]), history of thyroid disease (OR = 5.102 [95% CI, 1.060 – 24.390]) and higher IOP (OR = 1.374 [95% CI, 1.268 – 1.488]) were associated with an increased risk of having OAG. In the subgroup analysis, normal-tension OAG was associated with older age (OR = 1.030 [95% CI, 1.002 – 1.059]), history of thyroid disease (OR = 5.155 [95% CI, 1.087 – 24.390]), higher IOP (OR = 1.167 [95% CI, 1.059 – 1.286]) and history of diabetes mellitus (OR = 2.639 [95% CI, 1.325 – 5.263]). High-tension OAG was only associated with higher IOP (OR = 2.510 [95% CI, 1.822 – 3.458]).

Conclusions: In the Namil Study, higher IOP, older age and thyroid disease were significant risk factors for having OAG. When analyzed separately, normal-tension OAG was associated with IOP, age, thyroid disease and diabetes mellitus, whereas high-tension OAG was only associated with IOP.

P351 RISK FACTORS FOR PRIMARY OPEN-ANGLE GLAUCOMA IN JAPANESE SUBJECTS ATTENDING COMMUNITY HEALTH SCREENINGS

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Background: To describe risk factors associated with primary open-angle glaucoma in Japanese subjects who participated in community health screenings.

Methods: Residents of Akita, Japan, participating in a community health checkup were selected to undergo a comprehensive ophthalmic examination. Glaucoma was diagnosed based on optic disc appearance, perimetric results, and other ocular findings. Systemic blood pressure and intraocular pressure were measured and ocular perfusion pressure was calculated. Logistic regression analysis was performed to determine risk factors for primary open-angle glaucoma patients.

Results and Conclusions: Of the 710 subjects examined, 26 had primary open-angle glaucoma. The estimated prevalence of primary open-angle glaucoma was 3.7%. After adjusting for age, the prevalence of primary open-angle glaucoma was similar to that found in the Tajimi Study of Japanese subjects. Multivariate logistic regression analysis demonstrated that older age (≤ 60 years, odds ratio 3.49), lower diastolic blood pressure (≤ 58 mmHg, odds ratio 2.11), higher intraocular pressure (≥ 19 mmHg, odds ratio 4.12), and lower ocular perfusion pressure (≤ 34 mmHg, odds ratio 5.78) were associated with increased risk of having primary open-angle glaucoma. In addition to the established risk factors of age and intraocular pressure, we found that lower diastolic blood pressure and lower ocular perfusion pressure contribute to the risk of developing primary open-angle glaucoma. These findings indicate a multifactorial etiology of primary open-angle glaucoma that may be relevant for identifying groups at high risk.

P352 BRIDGING THE MAJOR CLINICAL TRIALS AND EVERYDAY CLINICAL PRACTICE: CENTRAL CORNEAL THICKNESS AND VISUAL FIELD DAMAGE ARE INDEPENDENT RISK FACTORS FOR PROGRESSION IN A 6-YEAR RETROSPECTIVE EVALUATION OF PATIENTS' ELECTRONIC CHART RECORDS

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Purpose: To evaluate risk factors for progression in a population of open angle glaucoma patients routinely followed up in a Hospital-based Glaucoma Clinic.

Methods: The records of 131 eyes (75 patients) routinely followed in the years 2004-2010 in a single center Hospital-based Glaucoma Clinic were retrospectively evaluated. The data were recorded by using the software Glaucoma Management System[®] and were sorted by applying a query for eyes with (a) at least one visual field test / year HFA 24/2 SITA, (b) two IOP readings/year, (c) open angle on gonioscopy, (d) a central corneal thickness (CCT) evaluation before being started on therapy and (e) a minimum follow up of six years. Visual field damage was staged by using Brusini's Glaucoma Staging System 2 (GSS2). Worsening by 1 stage / 10 years (i.e. 0.6 of a stage in 6 years) was considered to be significant to label an eye as 'progressing'.

Results: 29/131 eyes (22/75 patients) met the criteria for progression. Mean rate of progression was 0.91 dB/year, meanwhile those eyes, who did not meet the criteria for progression, showed a 0.03 dB/year. Baseline IOP ranged between 22 and 28 mmHg. IOP during follow up ranged between 14 and 22. Mean IOP during follow up was 18.1 mmHg in the non-progressing and 18.4 in the progressing cohort ($p > 0.4$, unpaired two-tailed Student *t* test). The eyes were further stratified according to CCT: (a) < 510 m, (b) between 510 and 550 m, (c) > 550 m. The percentage of progressing eyes among the three categories of CCT readings were 57% in (a), 45% in (b) and 10% in (c). A multivariate analysis (GBStat for Windows) dissected, as independent risk factors for progression, (a) CCT < 550 m (OR 2.3-5.9, $p < 0.0001$) and (b) baseline MD > 4 dB (2.5% risk / 0.1 dB, $p < 0.001$).

Conclusion: This everyday data set confirmed that CCT < 550 m and a Mean Defect > 4 dB can be considered as independent risk factor for progression in open angle glaucoma over a 6-year interval.

P353 STUDY OF THE RETINAL NERVE FIBER LAYER THICKNESS IN PATIENTS WITH NEOVASCULAR AGE-RELATED MACULAR DEGENERATION TREATED WITH INTRAVITREOUS RANIBIZUMAB

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Background: The inhibitors of the vascular endothelial growth factor (anti-VEGF) have been located recently as the treatment of choice for the wet form of Macular Degeneration (AMD). But these treatments have aspects that are not completely clarified, like the effect that repeated intravitreal anti-VEGF drugs may have on other ocular structures such as nerve fiber layer of the retina (RNFL). Our main objective is to prospectively evaluate the changes in the retinal nerve fiber layer (RNFL) thickness and in the intraocular pressure (IOP) induced by repeated injections of ranibizumab intravitreally.

Methods: Prospective controlled and longitudinal trial with one year of follow-up including 54 eyes with neovascular age-related macular degeneration (AMD) susceptible to receive intravitreal ranibizumab and 29 contralateral eyes not requiring treatment. IOP was registered before and after each injection and the RNFL thickness with the RNFL thickness of the Spectralis® Fourier Domain Optical Coherence Tomography protocol was measured at baseline and months 1, 3, 6 and 12.

Results: 46 cases and 25 control eyes completed 6 months of follow-up. The average of intravitreal injections was 3.73 ± 0.9 . Incidence of elevations in IOP (> 5 mmHg beside baseline IOP) one hour after intravitreal injections was 0.05%. Basal average RNFL thickness was 107.9 ± 17.0 microns in the study group and 103.5 ± 14.4 microns in the control group. At 6 months of follow-up average RNFL thickness was 101.9 ± 13.9 microns in the study group and 99.7 ± 11.6 in the control group. We have not found a significant difference between both groups in the follow-up ($p = 0.292$). The differences analyzing by quadrants were not statistically significant

(superior $p = 0.931$, inferior $p = 0.732$, nasal $p = 0.879$, temporal $p = 0.158$).

Conclusions: Significant changes in the RNFL thickness after repeated injections of ranibizumab intravitreally in the treatment of AMD have been not found at 6 months of follow-up.

P354 OCULAR BLOOD FLOW: A RISK FACTOR FOR GLAUCOMA PROGRESSION?

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Objective: To determine whether the baseline measurements of ocular blood flow (OBF) are predictive of glaucoma progression.

Methods: 262 eyes of 262 glaucoma suspect individuals were prospectively and consecutively recruited. All of them had normal standard automated perimetry results, glaucomatous optic disc appearance and/or elevated intraocular pressure (≥ 21 mmHg) at baseline. Topographic analysis of the optic nerve head was performed using the Heidelberg retina tomograph (HRT3; Heidelberg Engineering, Heidelberg, Germany) and blood flow velocities of retrobulbar vessels were measured by color Doppler imaging (Siemens Sonoline Sienna, Germany). Progression was assessed according to the changes in the color-coded Moorfields Regression Analysis classification of HRT3 during the four years follow-up. Hazard ratios (HRs) for the association between flow and clinical parameters and the development of a documented progression were obtained by multivariate Cox proportional hazards models.

Results: At the end of the study, 36 patients met the criteria for conversion to glaucoma (13.74%). The group of converters had reduced end-diastolic velocity ($p < 0.001$) and increased resistivity index (RI) and pulsatility index in the ophthalmic artery (OA) with respect to the group of non-converters ($p < 0.001$). The results of multivariate analysis of survival by Cox regression shows the predictive value of the vertical cup-to-disc (CD) ratio ($p < 0.001$) and RI of the AO ($p < 0.004$) as independent parameters for conversion to glaucoma.

Conclusions: Abnormal OBF parameters measured by color Doppler ultrasound may be a risk factor for glaucoma progression. CD ratio and RI of the OA were associated as independent risk factors for glaucoma.

P355 CATARACT AND OCULAR HYPERTENSION IN CHILDREN ON INHALED CORTICOSTEROID THERAPY

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Purpose: To ascertain the incidence of posterior subcapsular cataract and ocular hypertension in a cohort of children ≤ 12 years on inhaled steroid therapy.

Patients and Methods: In this prospective study, a detailed history regarding and corticosteroid therapy was obtained for children attending an asthma clinic. The presence and type of lens changes (cataract) was recorded and intraocular pressure (IOP) was measured. The children underwent another eye examination 2 years later.

Results: Ninety-five patients were enrolled in the study.

Mean patient age was 7 ± 3 years, and a mean duration of inhaled steroid therapy was 2 ± 1 years. Thirty-six percent of patients received inhaled steroids exclusively, 61% received inhaled steroids with a short course of oral steroids, and 3% received inhaled steroids with a long course of oral steroids. Only 3 (3%) patients had cortical changes that were not visually significant, and none had posterior subcapsular or nuclear cataract. There was no significant differences between children with cataract and those without cataract with respect to age; duration of asthma; and duration; average daily dose of inhaled steroids. IOP ranged from 11 to 20 mmHg (mean, $16 \pm$ mmHg). None of the children had ocular hypertension or glaucoma. Ninety patients underwent eye examination 2 years later; none was found to develop posterior subcapsular cataract or increased IOP.

Conclusion: This study indicates the use of inhaled steroids in children with asthma is probably safe as far as not inducing posterior subcapsular cataract or ocular hypertension.

P356 RISK FACTOR FOR UNILATERAL CONSECUTIVE RETINAL NERVE FIBER LAYER DEFECT PROGRESSION IN NORMAL-TENSION GLAUCOMA

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Background: To determine ocular risk factors for the unilateral consecutive retinal nerve fiber layer (RNFL) defect progression in normal-tension glaucoma (NTG) patients.

Methods: The study included 55 NTG patients showing unilateral consecutive progression of localized RNFL defect on serial red-free fundus photographs. Mean follow-up period was 76.4 months (range, 32.0 – 156.0 months). There was no change in the localized RNFL defect of the contralateral eyes during follow-up period. Disc stereophotography, red-free fundus photography, and standard automated perimetry were performed annually. Univariate and proportional hazards models were used to evaluate the following potential risks factors: spherical equivalent of refraction, central corneal thickness, disc hemorrhage, peripapillary atrophy, baseline diurnal intraocular pressure (IOP), long-term mean IOP, short-term and long-term IOP fluctuations, and parameters of standard automated perimetry.

Results: Widening of the localized RNFL defect toward the macula was the most common one ($n = 33$; 60.0%). Only presence of disc hemorrhages (hazard ratio: 4.84; 95% confidence interval: 2.43-8.92) was significantly associated with the unilateral consecutive progression.

Conclusions: Presence of optic disc hemorrhages is an independent risk factor for the unilateral consecutive localized RNFL defect progression in NTG patients.

P357 THE NUMBER NEEDED TO SWITCH: A CLINICALLY USEFUL TOOL FOR THE COMPARISON OF TWO TREATMENTS

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Background: Competing medications or treatments frequently offer marginal benefits over one another. The purpose of this study was to develop a new statistic. The Number Needed to Switch, to illustrate the clinical relevance of differences in treatment effect between two treatments.

Methods: A novel application of the Number Needed to Treat was applied to the difference in efficacy, as reported in a recent meta-analysis, between two topical prostaglandins (latanoprost 0.005% and bimatoprost 0.03%). Bimatoprost was reported to lower the intraocular pressure by an additional 0.78 mmHg (average of weighted means across all time points) compared with latanoprost. We wanted to answer two questions (1) 'If I give bimatoprost instead of latanoprost to a prostaglandin naïve patient, assuming the patient would respond to both treatments, how many patients would I need to treat to prevent 1 extra patient from progression of glaucoma?' and (2) 'How many patients would I have to switch from latanoprost to bimatoprost to prevent 1 extra patient from progression of glaucoma, compared to leaving them on latanoprost.' Both questions are mathematically equivalent and we present an analysis that answers this question in a low-risk and a high-risk scenario. We have called this new statistic the Number Needed to Switch.

Results: The Number Needed to Switch is the inverse of the difference in absolute risk reduction of each of the two treatments. The difference in the absolute risk reduction can be obtained by multiplying the baseline risk of the patient (patient expected event rate or PEER) by the difference in risk reduction between the two treatments (RR_{diff}). We used the results of the Ocular Hypertension Treatment Study and the Early Manifest Glaucoma Trial to calculate the Number Needed to Switch in two situations. For a low risk patient with ocular hypertension at 10% risk of conversion to glaucoma over 5 years, 100 patients would need to be given bimatoprost in place of latanoprost to prevent 1 extra patient from developing glaucoma. This compares to a Number Needed to Treat (with any medication that can reduce intraocular pressure by at least 20%) of 20. For a high-risk patient with advanced glaucoma that is progressing despite medical treatment, only 10 patients would need to be given bimatoprost in place of latanoprost (or switched from latanoprost to bimatoprost) to prevent 1 extra patient from progressing compared to giving latanoprost alone.

Conclusion: The difference between the prostaglandins is small, therefore the Number Needed to Switch is high compared with the Number Needed to Treat. Nevertheless it is clear that the higher the baseline risk of the patient, the more effective a switch in treatment becomes. On the other hand, for lower risk patients who are less likely to benefit from a marginal increase in treatment effect, other considerations such as side effects and cost are more important than simply treatment efficacy in itself. The Number Needed to Switch provides a useful illustration of the clinical effect of a difference in treatment efficacy and can help clinicians to make more informed treatment decisions.

P358 WHAT DO WE KNOW ABOUT CENTRAL CORNEAL THICKNESS DISTRIBUTION IN THE TOGOLESE POPULATION?

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Introduction: Central corneal thickness (CCT) is considered more than ever as risk factor in primary open-angle glaucoma development and its progression. In the Togolese population, authors would like to describe characteristics and the distribution of central corneal thickness.

Material and Methods: It's a matter of retrospective study of patients glaucomatous and non glaucomatous followed in the eye unit of Tokoin teaching hospital of Lomé from January to September 2005. All subjects underwent central corneal thickness with an ultrasonic pachymeter between 8 and 11 am with the same manipulator.

Results: A total of 1,205 subjects (609 men and 596 women) were involved in the study corresponding to 2410 eyes. The participants were 3 to 85 years old. The average central corneal thickness measurements is $532.94 \pm 34.82 \mu\text{m}$ for the whole sample, $532.56 \pm 36.25 \mu\text{m}$ in the right eye, $533.44 \pm 35.96 \mu\text{m}$ in the left eye, $536.38 \pm 34.67 \mu\text{m}$ in men and $529.41 \pm 34.64 \mu\text{m}$ in women. The central corneal thickness is thick ($542.94 \mu\text{m}$) in subjects aged between 6 and 10 years and has gradually decreased after 35 years.

Conclusion: Black subjects had thin central corneal thickness that could be correlated with the higher prevalence of ocular hypertension and glaucoma. The coupling of corneal pachymeter with the intraocular pressure measurements is essential in the early taking care of high intraocular pressure and glaucoma, particularly with melanoderma subjects.

P359 THE DIAGNOSTIC VALUE OF THE BIOMECHANICAL COEFFICIENT IN PERSONS WITH SUSPECTED GLAUCOMA

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Purpose: to assess the diagnostic and prognostic value of the biomechanical coefficient in persons with glaucoma and suspected glaucoma.

Material and Methods: 26 patients aged 60.1 ± 3.4 with suspected glaucoma, 155 patients aged 67.0 ± 8.4 with POAG and 35 patients aged 62.8 ± 6.5 with no eye pathology have been examined. The central visual field was evaluated using SAP; structural changes of the optic disc were measured with HRT-II. Ocular Response Analyzer was used to measure corneal hysteresis (CH) and central corneal thickness (CCT). A new parameter, biomechanical coefficient (BC), was introduced: $BC = CH / CCT \times 50$. Collagen content in scleral samples obtained during glaucoma surgery was measured using amino acid analysis, cross-linking level – by Differential Scanning Calorimetry.

Results: In normal patients, BC values varied between 0.82 and 1.12. As glaucoma progressed, BK showed a statistically significant decrease, which implies that biomechanical properties of the corneoscleral capsule change in glaucoma. It can be viewed as sclera remodeling, which aggravates as glaucoma progresses. This is corroborated by significantly growing scleral cross-linking and an increase of collagen content: in stage I, the level of scleral collagen was $47.0 \pm 1.1\%$ of dry tissue weight, in stage II, $50.8 \pm 0.9\%$ and in III, $53.3 \pm 0.4\%$. 29% patients with suspected glaucoma had low BC (0.73-0.78) and CH within 8.1-9.9 mmHg. A detailed examination showed local visual field defects in the paracentral area (MD of 4.2dB, PSD 3.3 dB) and a drop in volume and area of the neuroretinal rim. Accordingly, glaucoma was diag-

nosed and hypotensive treatment prescribed. Follow-up examinations after 6 and 12 months demonstrated no negative dynamics. In 36% patients with normal optic disc figures, BK was lower than 0.82 (0.63-0.81), being the only reduced parameter ($p < 0.05$). CH values lay within 7.1-9.8 mmHg, CCT was 494-584 microns. In 6 and 12 months, 51% of such patients developed a depression of threshold photosensitivity and smoothing of the retinal surface profile, which underpinned the diagnosis of glaucoma and ascertained the diagnostic and prognostic value of BC. In 35% patients with suspected glaucoma, BK (0.89-1.16) and CH (10.1-13.6 mmHg) were within the norm, CCT was high (576 to 602 microns). MD, PSD and optic disc parameters were within the norm, so the diagnosis of glaucoma was revoked. Examinations performed after 6 and 12 months showed no changes in the parameters or glaucoma symptoms.

Conclusions: The proposed biomechanical coefficient increases the effectiveness of diagnostics and prognosis if glaucoma is suspected.

P360 PREVALENCE OF GLAUCOMA IN SLEEP APNEA. PROSPECTIVE STUDY

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Backgrounds: To determine the prevalence of glaucoma in patients with sleep apnea.

Methods: Prospective study, cross-sectional, of 118 patients with recent polysomnographic diagnosis of obstructive sleep apnea, in which a complete ophthalmologic examination was performed, including visual acuity, biomicroscopy, intraocular pressure (IOP), pachymetry, gonioscopy, optic nerve head assessment, and automated perimetry.

Results: The mean age was 38 years, 31 patients were female and 87 were males. Three patients have been previously diagnosed of glaucoma, one of them having normal pressure glaucoma. Twenty-six patients were found to have possible glaucoma due to the optic nerve head configuration (6 patients), perimetric anomalies (13 patients) or both (7 patients). Of these, two patients had also raised IOP, and were diagnosed of glaucoma, and another 8 patients were found to have glaucomatous optic nerve head changes or perimetric anomalies typical of glaucoma, with normal IOP, possibly having normal pressure glaucoma. Glaucoma, with raised or normal pressure, was present in 13 of 118 patients, this implies a prevalence of 11%. Normal pressure glaucoma was found in 9 patients, which represents a prevalence of 7.6%.

Conclusions: Several reports have dealt with the prevalence of glaucoma in patients with sleep apnea, which has been found to be as high as 27%, while others have found the same prevalence than in the general population. Normal pressure glaucoma also seems to be frequent, with a prevalence of 5.9%. In our study, 11% of patients had glaucoma (normal or elevated pressure), and 7.6% had normal pressure glaucoma, being these figures higher than it would be expected.

P361 THE INVESTIGATING MANAGEMENT OF PRIMARY ANGLE CLOSURE AND TREATMENT STUDY – ‘IMPACT’: RATIONALE AND METHODOLOGY

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Background: To investigate the effect of two ocular laser treatments, peripheral iridotomy (PI) and argon laser peripheral iridoplasty (ALPI), in patients with an occludable anterior chamber angle (primary angle closure suspect, PACS), and eyes where this process has become more advanced with the development of a persistently raised intraocular pressure (IOP) and/or other secondary features (primary angle closure, PAC). The effect of the laser treatments will be measured by investigation of morphological and functional differences between the states of PACS and PAC over a period of 6 months. The study aims to explore the anatomical risk factors associated with PACS and PAC conditions, and how these risk factors can be modified by these laser treatments.

Methods: 70 patients diagnosed with PACS and/or PAC in either eye were invited to participate in the study. Participants receive PI to a randomly selected eye. If the anterior chamber angle remains open 3 months following PI, the eye is randomized to either observation only or ALPI. Patients are followed over a 6 month period post-PI. The baseline and final data was collected using the following tests/procedures: Visual Acuity, Subjective Refraction Visual Field, Slit-Lamp Examination (dilated and non-dilated pupil), Diurnal IOP Phasing, Supine IOP, Dark Room Provocation Test, A-Scan, 3-Dimensional Ocular Coherence Tomography of Anterior Chamber (light, dark and pharmacologically dilated pupil conditions), Specular Microscopy of Corneal Endothelium, Fundus Photography, Heidelberg Retinal Tomography (HRT) and posterior segment Ocular Coherence Tomography. Interim visits involved a combination of these tests.

Results: This study has been adopted onto the UK National Institute for Health Research portfolio and is currently in the recruitment phase, with baseline data of participants to be reported at the World Glaucoma Congress 2011 meeting.

Conclusions: Limited information exists regarding the response of Caucasian eyes to these laser procedures and the natural history of these conditions, which have a considerable impact on resources for patients and providers of healthcare in the United Kingdom. This study, while being relatively small for the purpose of studying the effect of laser on the natural history of these conditions, is expected to provide information on the investigations and outcome measures required for the design of a larger multi-center study.

P362 INFECTION AS A RISK FACTOR OF RELAPSE DEVELOPMENT AFTER ANTI-GLAUCOMA OPERATIONS

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Actuality: There is an appreciable group of patients with relapses after spent anti-glaucoma operations in spite of successes of glaucoma treatment reached in last years. We can

see reason of excessive cicatrization of again framed outflow tracts which can support the infectious factor. Various hemato-genic forms of ophtalmoxlamidiaz which are connected with lesion of a vascular cover and diffusion of inflammatory process on a retina, an optic nerve and a cornea, and also are connected with the scleras bound to a lesion. Very often bacteria of sort Bacteroides are allocated from a conjunctival cavity. The purpose of our work was research of influence of the infectious factor (chlamydial, bacteroid and ureaplasma infections) on repeatedly and unsuccessfully operated primary glaucoma. It was connected with considering pathogenic properties of the infections set forth above.

Materials and Methods: We investigate 18 patients with repeatedly operated glaucoma (I group) and 37 patients with unitary operated glaucoma (II group). Their age was from 61 till 84 years and has on the average made 70 years. Patients with acute and subacute conjunctivitis, blepharitis, amotio of a retina, an age macular degeneration in research did not include. All patients were investigated by scrapes from conjunctiva, a blood, scrape from men urethra channel, an epithelium of women uterus neck, using a method of a direct immunofluorescence (DI). It is considered that sensitivity of the given method makes 95 %, specificity of 98 %. As it was used cultural method (cultivation on the admixed culture of cells L929 + WERO + LC-MK2).

Results: By results of laboratory diagnostics the mikst-infection in I group is diagnosed for 93%. The infection is taped at 86% in a conjunctiva, in a blood at 74%, in a genitourinary tract at 93%. In II group the mikst-infection is diagnosed for 52%. Including in a conjunctiva the infection is taped at 46%, in a blood at 41%, and in a genitourinary tract at 52% of patients that is authentic less, than in I group ($p < 0.05$). Thus the most appreciable share was made by chlamydial infection in a combination with bacteroid. Chlamydias in a combination with bacteroides in an organism of patients of I group are taped at 73 %, in an organism of patients of II group at 36% ($p < 0.05$). The ureaplasma in both groups is taped all at 6%. During 40% of patients of I group the infection is taped simultaneously in a conjunctiva, a blood and a genitourinary tract, and at patients of II group at 16 % of patients ($p < 0.05$).

Conclusions: Taking into account single-step revealing of studied infections in an urethra, a blue blood and a conjunctiva at the first group (40%), it is possible to assume that it is a question of system infectious process. The chlamydial infection in a combination with bacteroides, possibly, can be a risk factor of development of relapses after anti-glaucomical operations and is bound to cicatrization and an obliteration of the outflow tracts of a watery moisture generated during an intervention.

P363 ASSOCIATION BETWEEN PRIMARY OPEN-ANGLE GLAUCOMA AND DIABETES MELLITUS IN DIFFERENT ETHNIC GROUPS OF NEPAL

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Background: Glaucoma is the most common cause of irreversible blindness worldwide. The 1981 Nepal blindness

survey quotes glaucoma as the fourth commonest cause of blindness. Overall glaucoma prevalence varies from 3-12% in Nepal depending on region and ethnic group. Primary open-angle glaucoma (POAG) is the most common type of glaucoma followed by angle closure glaucoma. Several studies originating from different parts of the world demonstrate diabetes mellitus as important risk factor for POAG. However, no such studies have been done in the Nepalese population. Therefore, we conducted a hospital based case-control study to investigate the association between POAG and diabetes mellitus in Nepal.

Methodology: We included individuals of all age groups who attended the ophthalmology outpatient department of two hospitals in the mid hills between February 2009 and July 2010. All newly diagnosed cases of POAG were registered as 'study cases' and age, gender and ethnicity matched individuals without POAG were enrolled as 'control cases'. All cases were subjected to visual acuity testing, refraction, anterior and posterior segment examination with slit lamp, binocular optic disc evaluation with 90D lens, intraocular pressure measurement, gonioscopy to visualize anterior chamber angle and Humphrey visual field test. POAG was diagnosed on the basis of presence of typical optic disc changes, open angle on gonioscopy and visual field changes with or without rise in intraocular pressure (IOP). After confirming the diagnosis, individuals with POAG and controls without POAG were interviewed by a blinded interviewer to determine history of presence or absence of diabetes mellitus.

Result: We obtained study subjects from the major ethnic populations Newar (44 cases/129 controls), Brahmin (42/123, respectively) and Gurung (35/103, respectively) living in the mid hills. The majority of them were between 45 and 75 years of age. POAG was seen more frequently in men in all ethnic groups; ranging from 63-69% ($p = 0.33$). A potential association between POAG and diabetes mellitus was evaluated separately for each ethnic group. In Newars, 36.4% among the cases and 7.7% among controls had diabetes mellitus with odds ratio 6.8 (95% CI 2.6:18.3, $p < 0.001$). In Brahmins, 30.9% among cases and 8.9% among controls had associated diabetes mellitus with odds ratio 4.6 (95% CI 1.7: 12.4, $p < 0.001$). Gurungs exhibited a similar pattern with 25.7% cases and 6.8% controls with diabetes mellitus; odds ratio 3.7 (95% CI 1.2: 11.5, $p = 0.01$).

Conclusion: Diabetes mellitus is a risk factor for primary open-angle glaucoma in the Nepalese population irrespective of their ethnicity.

P364 PREVALENCE OF GLAUCOMA IN OBSTRUCTIVE SLEEP APNEA SYNDROME AND FLOPPY EYELID SYNDROME

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Background: To determine the prevalence of glaucoma in obstructive sleep apnea-hypopnea syndrome (OSAHS), an entity characterized by repetitive upper airway obstructions during sleep, inducing hypoxia with the risk of cardiovascular

and neurologic sequelae, and to examine floppy eyelid syndrome (FES) as a risk factor of glaucoma in patients with OSAHS.

Material and Methods: 111 patients consecutively referred to polisomnographic evaluation of suspect OSAHS seen at Department of Sleep. The other group of study comprised 40 patients with FES seen at Department of Ophthalmology. All patients of the Department of sleep and 27 of 40 patients of Department of Ophthalmology underwent an overnight sleep study in an effort to diagnose and determine the severity of OSAHS; presence of OSAHS as defined by an apnea-hypopnea index (AHI) ≥ 10 . All patients received an ophthalmological evaluation including visual acuity, slit-lamp examination, Goldmann applanation tonometry, gonioscopy, fundus examination, computerized perimetry and retinal fibre layer measurements with an optical coherence tomography. Presence of FES as defined by subjectively easy eyelid eversion, tarsal papillary conjunctivitis and lash ptosis.

Results: 86 (77.4%) of 111 patients seen at Department of Sleep had an IAH ≥ 10 , which indicates OSAHS. Seven of 86 OSAHS patients (8.9%) had glaucoma. No patient of the control group (AHI < 10) had glaucoma. The observed prevalence of glaucoma in patients with OSAHS (7 of 86, 8.9%) was significantly higher than expected in a white population (2%) ($p = 0.001$). Three patients had primary open-angle glaucoma (POAG), one had normal-tension glaucoma (NTG) and four patients had previously diagnose of glaucoma. 24 of 27 patients (88.8%) with FES seen at Department of Ophthalmology, had OSAHS (IAH ≥ 10) and 9 of 24 patients with FES and OSAHS, had glaucoma (37.5%). 5 of 9 patients (55.5%) with FES and OSAHS had NTG, 4 patients (33.3%) had POAG and 1 patient had previously diagnose of glaucoma. Prevalence of glaucoma in patients with FES and OSAHS were significant higher compared to prevalence of glaucoma in patients with OSAHS and without FES ($p < 0.001$).

Conclusion: Patients with obstructive sleep apnea-hypopnea syndrome constitute a high-risk population for glaucoma. Our study confirmed the association between floppy eyelid syndrome and OSAHS. Floppy eyelid syndrome in patients with OSAHS may be a risk factor for glaucoma and should therefore be screened for glaucoma.

Clinical Glaucoma: Exfoliation Syndrome

P365 PLASMA C-REACTIVE PROTEIN LEVELS IN PSEUDOEXFOLIATION (PXF) GLAUCOMA AND COMPARED WITH NORMAL POPULATION

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Background: Pseudoexfoliation (PXF) glaucoma is a senile disease which affects anterior segment structures of eyes. PXF material has also been found in heart, lung, liver, gall bladder, cerebral meninges, skin, and blood vessels and is thought to be a systemic disorder. C-reactive protein (CRP)

is an acute phase reactant found to be an important and sensitive marker of systemic inflammatory states and disorders. The purpose of this study was to determine the plasma C- reactive protein levels in pseudoexfoliation glaucoma and compare with normal people.

Methods: This case controlled study was performed on 73 cases that referred to Farabi eye hospital in Tehran. Patients were divided into two groups: 39 cases PXF glaucoma without any other ocular and systemic disorder and 34 controls, with no evidence of PXF glaucoma. In both groups, patients with blood pressure, CNS and cardiovascular diseases were excluded. Plasma CRP levels of all the study participants were determined and compared.

Results: The mean age was 68.4 ± 6.4 years in case group and was 65.3 ± 7.2 years in control group. The mean plasma CRP level in patients was 1.85 ± 2.52 and in normal people was 1.66 ± 1.64 . Plasma CRP levels were not different in the PXF cases with controls. There was no relationship between CRP level and the disease in male and female groups in different ages.

Conclusion: Our findings suggest that PXF may not be associated with plasma CRP levels and inflammatory causes of PXF glaucoma is debate.

P366 RISK FACTORS FOR FAILURE OF INFERIOR-APPROACH TRABECULOTOMY ON EXFOLIATION GLAUCOMA

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Background: Although trabeculectomy is effective in controlling intraocular pressure in exfoliation glaucoma patients, it is difficult to maintain good functional bleb over a long-term period because postoperative inflammation often breaks down the blood-aqueous barrier and leads to a decrease in aqueous production, which can easily cause stronger adhesions under the conjunctiva or around the scleral flap in the early post-operative period. Inferior-approach trabeculectomy is also known to be effective in some cases of exfoliation glaucoma, and does not influence the outcome of future trabeculectomy because it leaves the superior conjunctiva untouched. However, there are some cases in which trabeculectomy is completely ineffective. Therefore, we investigated the post-operative risk factors involved in inferior-approach trabeculectomy on exfoliation glaucoma.

Methods: We retrospectively evaluated 37 eyes of 37 exfoliation glaucoma patients who had undergone inferior-approach trabeculectomy with or without phacoemulsification and intraocular lens insertion between Jan 2005 and Dec 2007 and were followed up for at least 6 months. We studied the relation between intraocular pressure 6 months after trabeculectomy and various factors including age, sex, eye side, surgical procedure, pre-operative visual acuity, pre- and post-operative intraocular pressure, pre- and post-operative number of medicines, and transient increase in intraocular pressure, as well as the relation between visual field progression and all of those same factors, using t-test, χ^2 test, Fisher exact test or logistic regression analysis.

Results: Intraocular pressure significantly decreased from

24.7 ± 5.1 mmHg to 14.5 ± 2.8 mmHg 6 months after surgery ($p < 0.01$) and the number of medicines significantly decreased from 3.0 ± 1.4 to 0.8 ± 0.7 ($p < 0.01$) 6 months after surgery. Also at 6 months after surgery the intraocular pressure of 25 eyes (67.6%) was 15 mmHg or less, that of 11 eyes (29.7%) was 16-20 mmHg, and that of 1 eye (2.7%) was over 20 mmHg. Nineteen eyes (51.4%) had a transient intraocular pressure increase of 30 mmHg or more. The risk factors significantly associated with intraocular pressure 6 months after surgery were age, surgical procedure, pre- and post-operative intraocular pressure, number of pre-operative medicines and number of medicines at 3 months after surgery. Logistic regression analysis revealed that two factors, age and numbers of pre-operative medicines, were significantly associated with intraocular pressure 6 months after surgery, and relative risk rates were 0.83 ($p < 0.05$) and 3.74 ($p < 0.05$), respectively. The risk factors significantly associated with visual field progression were pre-operative intraocular pressure and number of medicines at 1 month after surgery.

Conclusion: In this study, inferior-approach trabeculectomy on exfoliation glaucoma reduced intraocular pressure to less than 16 mmHg in about 60 % of patients at 6 months after surgery, and the risk factors for failure identified in this study suggest that this procedure is suitable for patients with a pre-operative intraocular pressure of 25 mmHg or less who seem able to tolerate a transient increase in intraocular pressure.

P367 PSEUDOEXFOLIATIVE GLAUCOMA: EPIDEMIOLOGY, CLINIC, TREATMENT PATTERNS

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Background: Pseudoexfoliative glaucoma (PEG) of patients with pseudoexfoliative syndrome (PES) is the most frequent variety of initial open-angle glaucoma (OAG). PES is the systemic disease characterized by presence of exfoliative grey-and-white material deposited in the eye tissue and other organs. The term 'pseudoexfoliative' was first suggested by G. Dvorak-Theobald in 1954. The total number of patients with PES is about 50-70 mln in the world. To many authors judgment, PES one of the major reasons for developing OAG. The aim of the investigation is to study clinic peculiarities development of initial open-angle glaucoma in combination with PES, to compare the major parameters of PEG and OAG, the clinic peculiarities of PEG.

Materials and Methods: The examination data of 120 (210 eyes) analyzed, who were under survey for progressive glaucomatic process. The patients were from 43 to 85 years old. The average age was 70.51 ± 8.46 years. I stage glaucoma – 42 eyes, II stage – 115 eyes, III stage – 45 eyes, IV stage – 8 eyes. To examine the patients we used visometry, perimetry, electrotonography, ophthalmoscopy, gonioscopy, optical coherent tomography. The clinic analysis (biomicroscopy, gonioscopy) subdivided the patients into two groups. 1. patients with PEG – 85 persons. 2. patients with OAG – 35 persons.

Results and Discussion: In our material the fact is noteworthy that 70% of the patients were with PES. The comparative analysis of clinic glaucoma (PEG and OAG) showed that the disease is progressing faster with PEG patients. Gonioscopy

showed more distinct changes of ACA with PEG patients, whose corneoscleral trabecules were noticeably sclerosised already at the first stage, as well as more vivid pigmentation of Shleme's canal and other ACA zones, ACA asymmetry. The intraocular pressure also higher with PEG patients than with OAG ones. All the 30 patients diagnosed for surgical treatment had PES indications, medical therapy was not successful with them, which justified their surgical treatment without much delay. The most effective medicament treatment is considered combination of timolol and travatan, which we often used to treat PEG patients. The efficacy of the given medicament combination was determined by the PEG stage at the initial stage with IOP compensation was attained with 84.5% of the patients, at the developed stage – 65%, at the advanced stage – only with 17.5%. Comparing the results of treating PEG and OAG patients it should be noted that PEG is more difficult to be treated with local medicament therapy than OAG, so it is more reasonable to use laser and surgical treatment at an earlier stage.

Conclusions: 1. In a large percent of cases (according to our findings – with two thirds of patients) OAG develops in combination with PES. 2. The glaucomatous process progresses faster with PEG patients. 3. PEG is more difficult to be treated by means of local medicament treatment of glaucoma patients with PES. 4. In PEG cases, more early ACA changes are observed as caused by early pigmentation of ACA zones, manifested in early sclerosis of trabeculae, ACA asymmetry.

P368 EARLY ONSET EXFOLIATION FOLLOWING MULTIPLE INTRAOCULAR SURGERIES

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Purpose: Exfoliation syndrome is exceedingly prevalent in the aging population. However, there are few reported cases of PEX younger than 50 years. Our purpose is to present early manifestation of exfoliative findings in young patients undergoing multiple intraocular surgeries.

Patients and Methods: A series of 4 glaucomatous patients undergoing multiple intraocular surgeries for glaucoma control are presented.

Case 1. A 28 year old, female physician was initially diagnosed with an advanced bilateral juvenile glaucoma in the year 1994. After 3 intraocular surgeries including posterior limbal sclerectomy and 2 trabeculectomies, and with an interval of 3 years to last operation, characteristic exfoliative materials appeared in the anterior segment of left eye, while the patient was 43 years old. The right eye underwent only one trabeculectomy and did not show exfoliation. The intraocular pressure was well controlled at last follow-up visit.

Case 2. A 27 year old housewife, without a glaucoma family history, was presented with intense headache in the year 1994. Three intraocular surgeries including two trabeculectomies and one shunting procedure was necessary to control intraocular pressure in the left eye. First evidences of exfoliation was noticed in the year 2007 at the age of 40. The contralateral eye did not demonstrate exfoliation.

Case 3. A 36 year old, male engineer was diagnosed with

advanced glaucoma in the year 2002. Trabeculectomy was performed on both eye to control the glaucoma. One year later, while the patient was 37 year-old and had a well controlled intraocular pressure, typical exfoliative materials detected in the left eye.

Case 4. A 10 days old girl, with a strong family history of glaucoma, was diagnosed with primary congenital glaucoma in the year 1987. After 5 intraocular surgeries to control intraocular pressure in the left eye, including trabeculectomy, 3 trabeculectomies, and shunting procedure, exfoliation was evident at the age of 18 years. The right eye was visual lost and was enucleated because of intractable pain.

Results: All of reported cases demonstrated exfoliative manifestations unilaterally in the eye undergoing more intraocular surgeries. The age of diagnosis pseudoexfoliation was below 50 in all cases. The earliest manifestation of pseudoexfoliation was at the age of 18 in a primary congenital glaucoma case.

Conclusion: Pseudoexfoliation could develop earlier in patients undergoing multiple intraocular surgeries. Surgical trauma could accelerate the disease process in the genetically predisposed subjects.

P369 EXFOLIATION SYNDROME (XFS) IN NIGERIA

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Background: XFS has been reported in many countries and regions of the world, but has been considered rare in sub-Saharan Africa. It has been found in the Bantu of South Africa (1), and in a few patients in the Gambia (2). However, there have been no reports of XFS from other nations of West Africa. It was not found in a series of glaucoma patients in Ghana (3). The aim of this study was to estimate the prevalence of XFS and its association with ocular disease in patients attending the eye clinic of the University College Hospital, Ibadan, Nigeria.

Methods: A total of 448 consecutive new patients, aged 30-90 years, who attended the eye clinic of the University College Hospital between December 2009 and November 2010 were included. Each patient had a complete ophthalmic evaluation, including relevant history, visual acuity testing, slit-lamp examination, applanation tonometry, gonioscopy, and dilated fundus examination. Patients with exfoliative material on the anterior lens surface and/or pupillary margin in either or both eyes were considered to have XFS.

Results: All the patients examined were from the southern part of Nigeria. The majority (94.2%) were of the Yoruba tribe from south-western Nigeria, while 5.8% of the patients were from south-eastern Nigeria. Of the 448 patients examined, {mean age 58.5 (SD13.8) years, 54.8% males}, 12 (2.7%) had XFS. All patients with XFS were of the Yoruba tribe. Their mean age was 65.6 (SD 5.6) years. There was a male predilection (66.7%). All the eyes with XFS had lenticular opacities. XFS was bilateral in 8 patients (66.7%). Of the bilateral cases, 7 patients (87.5%) had glaucoma and lenticular opacities in both eyes. One patient with unilateral XFS had bilateral glaucoma which was worse in the affected eye. On gonioscopy, one patient (8.3%) had anatomically narrow angles, while 91.7% had open angles.

Conclusion: This is the first report of the existence of XFS in Nigeria. Larger studies need to be done in this population to further investigate the disease.

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P370 PECULIARITY OF IRIS IN PATIENTS WITH PSEUDOEXFOLIATIVE SYNDROME

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Background: to study peculiarities of iris in patients with pseudoexfoliative syndrome.

Material and Methods: Peculiarities of iris were studied in 186 patients (186 eyes) with cataract and pseudoexfoliative syndrome. Patients were divided into two groups: 1-group 94 patients (94 eyes) with cataract and pseudoexfoliative syndrome, 2-group 92 cataract patients (92 eyes) without pseudoexfoliative syndrome. In all patients with pseudoexfoliative syndrome there was destruction of pigment layer, loss of pigment and color changes. Among eyes with bright colored irises (blue or grey) there was specific lesion in pupil area best visualized in reflected light called as transillumination phenomena. In eyes with dark irises, mostly Asian ethnicity patients, there were dystrophic changes with abundant distribution of pigment on iris surface (dominantly in pupil area). In contrast to syndrome of pigment dispersion described for bright colored European eyes, in this case pigment dispersion was equal along surface and has not been found inside crypts. Pigment dots with diffuse distribution in lower part or anterior chamber were found in cornea endothelium in 38, 7% of examined patients (72 eyes). Another symptom described as a special feature of pseudoexfoliative syndrome: revealed or increased pigment dispersion after pupil dilation was noted only in 4, 3% (8 eyes).

Conclusion: The pupil evaluation is the important part of eye examination. In eyes with masked pseudoexfoliative syndrome pupil dilation was less in comparison to 'intact' eye in 78% of patients.

P371 QUANTATIVE ANALYSIS OF INTRINSIC PROTEINS EXPRESSED IN PSEUDOEXFOLIATION LENS CAPSULE EPITHELIUM

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Background: Pseudoexfoliation (PXF) is a very common reason for secondary glaucoma which is characteristic of pseudoexfoliation material, while the exact mechanism of it is still not clear. The purpose of this study is to compare the expression of intrinsic proteins expressed in the epithelium of lens capsule between normal and pseudoexfoliation patients.

Methods: Lens capsules (LC) were obtained from normal and pseudoexfoliation eyes during cataract extraction surgery through avascular cornea and without contamination by hemorrhage. Immunofluorescence (IF) of different proteins including histone H3, beta-crystallin, calpain 2 and keratin were used on formaxin-fixed lens capsule sections. The staining signals were calculated by Image J and compared by SPSS 15.0 software. Western blotting of solubilized LC (pooled by minimum 7 specimens) was used to compare these proteins' expression levels between normal and PXF eyes.

Results: All these four intrinsic proteins were higher expressed in PXF eyes than in normal eyes based on that the internal control of DAPI staining had no difference. The mean signal values of histone H3, beta-crystallin, calpain 2 and keratin in PXF eyes were 11.76 ± 6.15 , 22.14 ± 6.95 , 22.36 ± 12.52 and 14.47 ± 7.09 while those in normal eyes were 6.66 ± 3.37 , 12.15 ± 4.48 , 9.60 ± 9.18 and 8.49 ± 1.86 separately. The differences of each protein between two groups were all significant (p value < 0.05). The Western blotting results showed that the bands in PXF groups were bolder than those in normal groups.

Conclusions: PXF is associated with changes in cell intrinsic protein expression of lens capsule epithelium. Many of these differentially expressed proteins (such as histones) are expressed in most cell types and are not eye-specific. It suggests that PXF is a systemic multi-factorial disease process that is also associated with the local presence of intraocular PXF material that causes glaucoma.

Clinical Glaucoma: Normal-Tension Glaucoma

P372 OPTIC NERVE SHEATH DIAMETER CORRELATES WITH INTRA-OCULAR PRESSURE IN NORMAL-TENSION GLAUCOMA PATIENTS

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Background: Intra-cranial pressure (ICP) has been implicated in glaucoma damage. The need for invasive procedures to measure this ICP has limited the research on this field of non-IOP related mechanisms. Recently, the measurement of the optic nerve sheaths diameter by B-mode ultrasound has been validated for indirect measure of this ICP. Our purpose with this study is: (1) to characterize the Optic Nerve Sheath Diameter (ONSD) in glaucoma patients (2) to identify ocular factors relating to the ONSD.

Methods: A prospective, cross-sectional, observer-masked study was performed. Three groups consisting of primary open-angle glaucoma (POAG) and normal-tension glaucoma (NTG) patients and healthy controls were defined. Each was subject to a B-scan ultrasound to measure the ONSD by an observer masked to the patient diagnosis. Intra-ocular pressure (IOP) and central corneal thickness (CCT) were determined in all patients and visual field defect in glaucomatous patients during the screening by a second observer.

Results: 119 patients were enrolled, amongst which 52

POAG, 33 NTG and 34 healthy. ONSD was 5.75 ± 0.81 , 5.84 ± 0.64 and 6.09 ± 0.76 mm, respectively (POAG vs healthy: $p = 0.05$; NTG vs healthy: $p = 0.23$; POAG vs NTG: $p = 0.63$). Patient's age did not relate to ONSD in any of the groups ($p > 0.5$ in all groups). Visual field damage and CCT were not correlated with ONSD in either of the glaucoma groups (POAG, $p = 0.81$ and 0.71 ; NTG, $p = 0.57$ and 0.99 , respectively). However, ONSD did correlate with IOP in NTG ($r = 0.45$, $p = 0.01$), contrary to POAG and healthy controls ($p = 0.87$, $p = 0.77$ respectively).

Discussion: ONSD may be significantly different in POAG patients when compared to control population. As the optic nerve fibers are known to decrease with age and glaucomatous damage, our results point to a dynamic ratio between the optic nerve fibers and the cerebral spinal fluid inside the sheaths. The observation that ONSD is correlated to IOP only in NTG patients may indicate that, in keeping with previous reports, the translaminar pressure is involved in the pathogenesis of optic neuropathy in this type of glaucoma. Indeed lower intracranial pressure may result in a higher translaminar pressure (and thus stress on the ganglion cell axons at the level of the optic nerve head) in patients that develop glaucoma with low IOPs.

P373 PSEUDO-NORMAL-TENSION GLAUCOMA DIAGNOSTIC UTILITY OF A NEW INTRAOCULAR PRESSURE DIURNAL CURVE METHODOLOGY

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Background: Normal-tension glaucoma (NTG) is a chronic progressive optic neuropathy with specific alterations in the optic disc and visual field defects, with open-angle and ocular pressure (IOP) values ≤ 21 mmHg. The different frequencies reported (from less than 1% to 65%) could be related to the methodology of recording IOP. In general, records are made in the usual consultation schedules and with the patient in a sitting position. The 24-hour diurnal tensional curve (DTC) frequently detects hidden peaks and high fluctuations outside of normal office hours, but requires hospitalizing the patient. The aim of this study was to investigate the usefulness of a new DTC methodology in patients with suspect glaucoma, testing whether the frequency of NTG diagnosis is less when comparing the results of the new method vs. IOP measurements with the patient in the sitting position at the usual consultation times.

Methods: In a sample of 50 glaucoma suspect patients (26 women/24 men) with IOP < 21 mmHg at the first consultation, a DTC was performed using the methodology developed by the author (RB). The average age was 53 ± 14 years. The first record of the morning (08.00 am) was carried out with a hand-held applanation tonometer with patients supine after spending 45 minutes in that position in a darkened room and with prior instructions to the patient to avoid factors known to influence the IOP. The other records (12 am, 04.00 pm and 08.00 pm) were made with the Goldmann tonometer in the sitting position. The curve with 4 records was called 'A', and curve 'B' was with the first supine record excluded. Hypertension was considered to be values > 21 mmHg. Structural damage was considered a rim volume < 0.320 mm³ (Heidelberg Retina Tomograph – HRT) and functional dam-

age the detection of an altered MD index (> 2 dB) in the Standard Automated Perimetry (Octopus 1-2-3, Program G1X).

Results: In the 100 eyes examined, 30 had functional lesions. In 93.3% -28/30- (IC95 = $77.8 - 99.2$) ocular hypertension was detected with curve A vs 23.3% -7/30- (IC95 = $9.8 - 42.3$) with curve B (p -Fisher < 0.0001). According to curve B, 70% of these eyes (21/30) would be classified as NTG but, in the same eyes, curve 'A' detected ocular hypertension. Of the 100 eyes examined, structural damage was detected in 42 eyes. In 92.8% of these (39/42), hypertension was detected with curve A vs 16.6% (7/42) with curve B (p -Fisher < 0.0001).

Conclusion: The new DTC methodology with the first IOP record with the patient supine allowed masked hypertension to be detected, avoiding overdiagnosis of NTG.

This method allows DTC to be incorporated into the daily practice of the ophthalmologist since hospitalization of the patient is not needed.

P374 COMPARISON OF THE OPTIC DISC RIM AREA TO RETINAL NERVE FIBER LAYER THICKNESS CORRELATION IN DIABETES AND IN NORMAL TENSION GLAUCOMA

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Background: To compare the correlation between neuro-retinal rim area of the optic nerve head and retinal nerve fiber layer thickness (rim-RNFL correlation) in 12 clock hour sectors in diabetic eyes with non-progressive RNFL defect and normal-tension glaucoma (NTG) eyes.

Methods: A retrospective cohort study with prospectively obtained data was performed on 79 eyes of 79 patients with preperimetric or early NTG and 25 eyes of 25 type II diabetes patients with a non-progressive RNFL defect over a period of at least 5 years. The rim-RNFL correlation of NTG eyes was analyzed using global and 12 clock-hour parameters using rim areas determined by Heidelberg retina tomography (HRT II) and RNFL thicknesses determined by optical coherence tomography (CirrusOCT). We sought to determine whether eyes with diabetes were above the 95 % prediction interval (PI) for the rim-RNFL correlation of NTG, for global and clock-hour parameters. Eyes with NTG or diabetes were also compared with respect to locations of involved clock hours on CirrusOCT.

Results: In NTG eyes, a significant linear rim-RNFL correlation was observed in global and all clock-hour sectors, except the 4 and 9 clock-hour sectors ($0.08 < r^2 < 0.56$, $p < 0.05$, respectively). Eighty four percent (21/25) of eyes with diabetes were above the 95 % PI of the rim-RNFL correlation of NTG in at least two clock-hour sectors, as compared with 36% (9/25) of eyes in terms of global parameter. Involved clock hours were observed more frequently in eyes with diabetes than in NTG eyes at 10 o'clock, but the opposite was observed at 6 and 7 o'clock ($p < 0.05$, respectively).

Conclusions: Type II diabetes patients with non-progressive RNFL were found to be relatively well differentiated from NTG patients by the rim-RNFL correlation, especially in clock-hour sectors. Furthermore, the two diseases differed in terms of the locations of RNFL defects, which suggests that the two disease entities have fundamental pathogenic differences.

P375 PSYCHIATRIC AND COGNITIVE ASSESSMENT OF NORMAL-TENSION GLAUCOMA PATIENTS AND IMPLICATIONS FOR PATIENT MANAGEMENT

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Background: Normal tension glaucoma patients have an increased frequency of psychiatric symptoms and cognitive impairment. Implications of this for ophthalmic practice need to be considered. This study aims to characterize the psychiatric profile in normal tension glaucoma patients as a significant proportion of these patients have psychiatric symptoms and cognitive dysfunction which has bearing on the management of glaucoma.

Method: A prospective study of 132 consecutive patients who presented between 2001 and 2006 with low tension glaucoma was performed. Normal tension glaucoma as verified by phasing with intraocular pressure ≤ 22 mmHg. Ophthalmic findings and progress from first presentation were documented as was medical and psychiatric history. Ninety-nine patients had cognitive assessment to include the minimal state examination (MMSE), national adult reading test (NART), auditory verbal learning test (AVLT) and general health questionnaire (GHQ) performed by the senior registrars of the psychiatric department.

Results: Of the 132 study patients, 79.2% patients (107) were aged more than 60 at presentation with 54.8% (72) females and 45.2% (60) males. 81.8% (221) of eyes had vision better than 6/12 at presentation. 34.4% (91 eyes) had advanced visual field defect. 64 (48%) had peripheral vascular disease and 34 (25.7%) were smokers. 32.5 % (43 patients) had neuroimaging (CT Scan/MRI brain). 9.8% (13 patients) of these patients showed generalized cerebral atrophy/ischemia of the small vessels of the brain. 18.5 % patients had a positive family history of glaucoma. 59 had peripheral vascular disease and 32 were smokers. Of the 99 patients who had cognitive testing, 27.5% had a GHQ score ≥ 5 indicating a psychiatric disorder, 21% scored ≤ 26 on the MMSE indicating mild to moderate dementia, 25% showed significant short term memory loss and 24% had a history of psychiatric disease. Of the 33 patients who did not have cognitive testing 25 were very poor compliers and 8 had advanced psychiatric disease.

Conclusions: Significant cognitive impairment and psychiatric disorder was documented in normal tension glaucoma patients compared to the data available on age matched controls. Normal tension glaucoma patients may benefit from proactive psychiatric assessment and treatment. These findings may also have bearing on prescription regime, compliance with anti-glaucoma medication, timing of glaucoma and cataract surgery and hospital attendances.

P376 MORPHOLOGICAL AND FUNCTIONAL DIFFERENCES OF NORMAL- AND HIGH-TENSION GLAUCOMA

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Background / Aims: Despite modern technologies for examination of the optic nerve and visual field, there remains controversy about the functional and morphological differences between normal (NTG) and open angle high tension glaucoma (HTG). Aim of the study was to compare the visual field (VF) loss in normal tension (NTG) and high tension (HTG) glaucoma with the same glaucomatous structural damage of optic nerve.

Methods: The retrospective study included 126 eyes with NTG which were matched on a case-by-case basis to 126 eyes with HTG with same optic disc area and cup/disc-ratio. The glaucomatous damage of the optic nerve was verified by analysis of neuroretinal rim volume and rim area. The nerve fiber layer was measured by HRT (RNFL) and GDx-VCC. Visual field (VF) was examined by Humphrey full threshold 30-2 program, calculating values for the mean deviation (MD), pattern standard deviation (PSD) and the probability scores.

Results: Eyes with NTG have significantly less visual field loss than those with HTG (mean \pm SD: MD -3.69 ± 5.03 dB vs. -9.77 ± 7.99 dB, $p = 0.0001$; PSD 4.80 ± 4.47 dB vs. 7.17 ± 4.41 , $p = 0.0001$). There were no differences in the HRT parameter disc area (NTG 2.32 ± 0.25 mm² vs. HTG 2.32 ± 0.23 mm², $p = 0.342$), rim area (NTG 1.03 ± 0.26 mm² vs. HTG 1.00 ± 0.30 mm², $p = 0.279$) or rim volume (NTG 0.2 ± 0.08 mm³ vs. HTG 0.19 ± 0.11 mm³; $p = 0.274$). The NTG eyes have a better preserved retinal nerve fiber layer (RNFL: NTG 0.17 ± 0.05 mm vs. HTG 0.16 ± 0.07 mm², $p = 0.099$; GDx sup: NTG 57.2 ± 10.4 μ m vs. HTG 49.9 ± 13.12 mm², $p = 0.0001$). Total and focal visual field loss is significantly correlated with the structural damage of the optic nerve in both glaucoma groups.

Conclusions: The cupping in eyes with NTG seems related to a primary loss of glial tissue compared to HTG, which results in a less affected retinal nerve fiber structure. This might be the reason for less visual field defects in this subgroup. The findings might support the classification of glaucoma as a primary neurodegenerative disease.

P377 CONTINUOUS IOP FLUCTUATION RECORDING IN NORMAL-TENSION GLAUCOMA PATIENTS

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Background: To perform 24-hour IOP fluctuations using a silicone lens embedding a strain gauge sensor in five normal tension glaucoma (NTG) patients in the presence or absence of anti-glaucomatous treatment and to show the clinical importance of this new diagnostic tool.

Methods: 24-hour continuous IOP fluctuation monitoring was performed on two occasions separated by at least 4 weeks in each patient. The continuous recordings were analyzed for differences between daytime and night-time data and for

repeatability over time. Furthermore, profiles recorded in each patient in treated and non-treated conditions were compared.

Results: Highly individual and repeatable profiles were obtained. Data recorded during daytime portions of the recordings showed higher coefficients of variation (CV) than night-time data. Positive and significant linear slopes for the transition period from wake time to sleep time were detected in all patients in the absence of anti-glaucomatous treatment, while in three patients of five no significant slopes were detected under treated conditions.

Conclusion: Our data suggest that the continuous IOP fluctuation monitoring device is sensitive to individual IOP rhythms and to differences in such rhythms due to anti-glaucomatous drug therapy. This new measurement possibility have direct consequences for the glaucoma treatment strategies, which can be performed for each patient customize.

P378 THE PREVALENCE OF OPTIC DISC HEMORRHAGES IN PATIENTS WITH OPEN-ANGLE GLAUCOMA

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Background: The appearance of optic disc hemorrhages (ODH) in healthy individuals is negligible, and is quite often in patients with glaucoma. According to the level of IOP, open-angle glaucoma is arbitrarily divided to high tension glaucoma (HTG) and normal-tension glaucoma (NTG). The aim of our study was to determine the prevalence of optic disc hemorrhages in patients with NTG and patients with HTG at the time of testing.

Methods: We reviewed 60 patients: 30 with NTG and 30 with HTG. All patients had complete ophthalmic examination that included assessment of visual acuity, examination of anterior chamber angle with Goldmann gonioscopes, measurement of intraocular pressure (IOP) by Goldmann applanation tonometry, indirect ophthalmoscopy with Volk 90 D superfield lens and visual field examination with the Octopus program G1, full threshold strategy (Octopus 500 EZ, Interzeag, Switzerland).

Results: There were no statistically significant differences in the number of patients with ODH between two groups of patients: two patients with NTG (6.7%) and two patients with HTG (6.7%) had optic disc hemorrhages at the time of test ($\chi^2 = 0.001$; $p > 0.05$). All patients with ODH belonged to the group of patients with early ($MD \leq 6dB$) or moderate visual field damage ($6 \leq MD \leq 12dB$).

Conclusion: An equal number of hemorrhage in patients with NTG and HTG in our study supports the fact that hemorrhage PNO are not directly related to the level of IOP and that vascular risk factors are significant only for NTG already have a role in the pathogenesis of HTG.

P379 PRESSURE-INDEPENDENT RATE OF PROGRESSION IN NORMAL-TENSION GLAUCOMA

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Background: Normal tension glaucoma (NTG) patients have progressive visual field (VF) loss with typical glaucomatous optic disc changes. Although intraocular pressure (IOP) is not elevated in NTG patients, it is a risk factor in this multifactorial disease and reduction of IOP has been shown to be effective in slowing this progressive disease. The fact that surgical reduction of IOP down to 10 mmHg could not completely stop VF progression in Japanese NTG patients indicates that not only pressure-dependent, but also pressure-independent factors are contributing to the progression of NTG. However, the rate of pressure-insensitive VF progression and whether it shows local or diffuse pattern of progression is not known at present. We aim to characterize pressure-independent rate of VF progression in NTG patients by comparing pre- and post-trabeculectomy rate of progression.

Methods: In our retrospective interventional case series, clinical records of 34 Japanese patients (12 male and 22 female) from two hospitals diagnosed with NTG with progressive VF loss who underwent successful trabeculectomy were recruited. All patients must have minimum of 3 years pre- and postoperative follow-up with Humphrey 30-2 Full Threshold Program with at least 6 reliable VF test results. The time course of the mean deviation (MD) and mean of total deviation (TD_{mean}) in six separate subfields were analyzed using a linear mixed effects model.

Results: Patient's age, IOP and MD at operation was 57.7 ± 9.6 years, 15.7 ± 1.7 mmHg and -12.7 ± 5.5 dB, respectively, the mean pre and post-trabeculectomy follow-up, 4.6 ± 1.5 years and 5.7 ± 1.2 years respectively. IOP was lowered to 10.3 ± 2.7 mmHg over the postoperative period with postoperative change rate of MD of -0.25 dB/year ($p < 0.0029$) which was less negative than preoperatively (-0.70 dB/year; $p < 0.0001$). The change rate of TD_{mean} improved postoperatively in the superior subfields and inferior paracentral subfields ($p < 0.0001$), while it remained unchanged in the inferior cecentral and inferior arcuate subfields ($p > 0.1$). The postoperative change rate remained negative in all but superior cecentral subfield.

Conclusions: IOP is a significant risk factor for NTG progression even with an IOP in the mid-teens. The current results suggest that pressure-independent VF progression in NTG was about -0.25 dB/year which almost uniformly affects the central 30° VF. The superior hemifield was more affected by pressure-dependent mechanism, while the inferior cecentral and inferior arcuate subfields by pressure-independent mechanism.

P380 PRE-PERIMETRIC NORMAL-TENSION GLAUCOMA STUDY: RISK FACTORS FOR FUNCTIONAL AND STRUCTURAL PROGRESSION

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Background: To determine risk factors for the development of visual field loss on standard automated perimetry or structural progression in preperimetric normal-tension glaucoma (NTG) patients.

Methods: The study included 72 eyes of 72 patients with preperimetric NTG. Mean follow-up period was 52.1 months (range, 24.0–156.0 months). Preperimetric NTG was defined as diurnal intraocular pressure of < 21 mmHg without any medication, glaucomatous optic neuropathy, glaucomatous visual field defect not on Humphrey threshold perimetry but on frequency doubling technology (FDT) perimetry, open iridocorneal angle, and no evidence of nonglaucomatous cause of optic nerve damage. Disc stereophotography, red-free fundus photography, and Humphrey threshold perimetry were performed annually. Glaucoma progression was defined as development of glaucomatous visual field defects on Humphrey threshold perimetry or progression of retinal nerve fiber layer defect and/or glaucomatous optic disc damage. Univariate and proportional hazards models were used to identify factors for the predicted progression.

Results: Functional and structural progression was detected in 7 (9.7%) and 17 (23.6%) eyes, respectively. Presence of disc hemorrhages (hazard ratio [HR]: 9.75; 95% confidence interval [CI]: 3.02–28.54), female gender (HR: 3.75; 95% CI: 1.08–12.56), and baseline FDT abnormality (HR: 3.53; 95% CI: 1.04–12.05) were associated with glaucoma progression.

Conclusions: The study identified 3 independent predictive factors for the glaucoma progression in preperimetric NTG. Among them, presence of disc hemorrhages was a highly predictive one.

P381 CALCULATED AGE OF ONSET FOR PATIENTS WITH PROGRESSIVE NORMAL TENSION GLAUCOMA

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Purpose: To estimate the age of glaucoma onset, using field-progression rate in a cohort of progressive normal-tension glaucoma (NTG) subjects.

Methods: NTG and field-progression were defined according to the Collaborative NTG Study in this cross-sectional analysis of a prospective cohort. The main outcome was estimated age of NTG onset from field-progression rate. That was taken as the age when the mean deviation (MD) would have been zero decibel (dB). The same progression rate was used to estimate the degree of MD loss at 90 years old.

Results: We recruited 166 eyes of 166 NTG subjects with field-progression having 36-months of follow-up, where 13.3% and 30.1% of subjects had calculated age of onset < 40 years old and between 40–59 years old, respectively. On average, the NTG patients might have started their functional loss 13.7 years prior to being diagnosed. If untreated, by 90 years old, one-third of this progressive group will go into blindness (MD worse than -28 dB). The mean number of systemic medical diseases ($p = 0.001$), systemic hypertension ($p = 0.022$) and ischemic heart disease ($p = 0.008$) were significantly more in older calculated age of onset group.

Conclusions: Our results support the notion on screening for possible glaucoma from 40 years of age onwards. Further work on cost-effectiveness of such screening is warranted. The study suggested the importance of treatment for progressive NTG, as more than one-third may be blind by 90 years old.

P382 NORMAL-TENSION GLAUCOMA: FOLLOW-UP OF A 25-YEARS SERIES OF PATIENTS

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Background: The effect of intraocular pressure (IOP) lowering in normal tension glaucoma (NTG) is now evidence-based, but the rates of progression in long-term clinical care are unknown.

Methods: All patients with NTG, diagnosed from 1980 to 2005 in the glaucoma clinic and with an observation time of at least 3 years, were included in this retrospective study. The diagnostic criteria were: verified glaucomatous visual field defect (Octopus), glaucomatous optic disc and diurnal IOP curves (08, 12, 16, and 19 o'clock) with peak pressure ≤ 24 mmHg after 3 weeks wash out of any existing medication. The eyes were treated with the aim of a target IOP ≤ 15 mmHg (peak pressure, diurnal curves). Thereafter, eye practitioners saw the patients every 4 months in combination with yearly control with Octopus in the clinic. In 2008 a follow-up was made. Progression was defined as a significant increase of mean deviation (MD) with time calculated by linear regression and rate of progression expressed as MD progression in dB/year.

Results: 52 patients were registered with NTG, but at follow-up 28 had died, leaving 6 men and 18 women with 47 eyes (one blind eye on inclusion). Mean age at diagnosis was 58 yr (range: 45–76 yr) and average follow-up 15 yr. Upon inclusion, slight, moderate, and advanced visual field defects (< 6, 6–12, > 12 dB) were observed in 23 (49%), 10 (21%), and 14 eyes (30%), respectively. Mean IOP during treatment was 15 mmHg (SD: 0.8) representing a reduction of 17 %. Combination therapy (3 drugs) were used in 14 of the 24 patients (58%), Argon laser trabeculoplasty (ALT) carried out in 32 of the 47 eyes (68 %) and trabeculectomy in only 3 eyes (6 %). Significant MD progression was observed in 27 eyes (57%) with an average rate of progression of 0.49 dB/year (SD: 0.41). Twenty-three (85%) of these eyes had a mean rate of < 0.2 dB/yr, 3 eyes (11%) a rate ≥ 0.2 and ≤ 2.0 dB/year and only 1 eye (3.7%) a rate of > 2 dB/year. The remaining 20 eyes had non-significant MD progression with an average rate of 0.05 dB/yr (SD 0.18). The follow-up period was 12 years in contrast to 16 years for the eyes with significant progression. Eyes with measured IOP values < 15 mmHg in more or less than 50% of occasions had significantly different mean rates of progression of 0.16 and 0.39 dB/yr ($p = 0.04$), respectively.

Conclusion: Most NTG eyes showed visual field progression after 15 years despite maximal medical treatment including ALT, but in most cases at a very slow rate, especially when IOP is lower than 15 mmHg.

Clinical Glaucoma: Secondary Open-Angle Glaucomas (other than Exfoliation Syndrome)

P383 RISK FACTORS FOR NEOVASCULAR GLAUCOMA AFTER VITRECTOMY FOR PROLIFERATIVE DIABETIC RETINOPATHY

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Background: Despite of vitrectomy and the combined intraoperative endolaser retinal photocoagulation for the treatment of proliferative diabetic retinopathy (PDR), vitrectomized eyes frequently encounter neovascular glaucoma (NVG). However, the characteristics of PDR patients with a high risk of NVG after vitrectomy remain unknown. Therefore, we investigated the characteristics of patients that encountered NVG after vitrectomy for PDR.

Methods: We retrospectively reviewed the medical records of consecutive patients who underwent vitrectomy for PDR at Kumamoto University Hospital between January 1st, 2003 and June 30th, 2009. The exclusion criteria were eyes with a history of glaucoma or intraocular pressure (IOP) \geq 22 mmHg before vitrectomy and eyes treated with vitrectomy to reduce macular edema because PDR patients with macular edema frequently received triamcinolone acetonide which affects IOP. If both eyes were satisfied with the study criteria, only the eye that was treated first was included. NVG after vitrectomy for PDR was defined as postoperative neovascularization in the anterior segment including the iris or angle though slit-lamp and gonioscope examination, and the association with IOP \geq 22 mmHg. The IOP \geq 22 mmHg within 2 months was not counted for the analysis because of early postoperative IOP fluctuations. But, when the patient underwent an additional surgery to treat postoperative NVG within 2 months after vitrectomy, the eye was regarded as NVG after vitrectomy for PDR. Kaplan-Meier survival analysis was applied to calculate the rate of NVG after vitrectomy for PDR. To reveal risk factors and their relative risks (RR) for NVG after vitrectomy for PDR, multivariable analysis was performed with the Cox proportional hazards model. The following variables were assessed as the potential risk factors; patient gender, patient age, preoperative vitreous hemorrhage, preoperative tractional retinal detachment, preoperative IOP defined as the average of three consecutive IOPs before vitrectomy, systemic hypertension, history of ischemic stroke in heart or brain, serum hemoglobin A1c concentration, serum creatinine concentration, preoperative panretinal photocoagulation, preoperative neovascularization in the anterior chamber angle, NVG in the fellow eye, combined phacoemulsification with vitrectomy, gas tamponade during vitrectomy, postoperative phakia and postoperative retinal detachment.

Results: In total, 512 patients (512 eyes) satisfied the study criteria. The mean follow-up period was 422 days. The Kaplan-Meier survival analysis revealed that the probability of the occurrence of NVG after vitrectomy at 6, 12, 24 and 36 months was 6.0%, 7.1%, 8.7% and 8.7%, respectively. The Cox proportional hazards model identified that male gender (relative risk; RR = 4.247; p = 0.0032), younger age (RR = 0.956 / year; p = 0.0237), higher preoperative IOP (RR = 1.203 / mmHg; p = 0.0335), neovascularization in the anterior chamber angle (RR = 8.899; p < 0.0001) and NVG in the fellow eye (RR = 5.355; p = 0.0013) were the significant risk factors.

Conclusions: The present study demonstrates that male, younger age, higher preoperative IOP, preoperative neovascularization in the angle and NVG in the fellow eye are risk factors for NVG after vitrectomy in PDR eyes.

P384 COMPARISON OF CYTOMEGALOVIRUS-POSITIVE AND NEGATIVE EYES IN POSNER-SCHLOSSMAN SYNDROME

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Background: Posner–Schlossman syndrome (PSS) (glaucomatocyclitic crisis) was characterized in 1948 by recurrent episodes of hypertensive iridocyclitis. The etiology is unknown but current theories favor an infective origin. In 2008, Chee and associates performed aqueous paracentesis on patients with presumed PSS, and more than 50% had cytomegalovirus (CMV) on polymerase chain reaction (PCR) testing. In their study, there were no clinically detectable differences between CMV-positive and negative presumed PSS eyes. The purpose of our study is to compare the characteristics of CMV-positive and negative eyes with presumed Posner-Schlossman syndrome (PSS).

Methods: Retrospective interventional case series. Eleven eyes of 11 patients with presumed PSS, seen at Nagoya City University Hospital from 2009 to 2010, underwent aqueous analysis for CMV by PCR. All patients received glaucoma surgery due to uncontrollable IOP. Their records were reviewed for clinical features and human immunodeficiency virus (HIV) status of the CMV-positive patients. The main outcome measures were age, gender, maximum intraocular pressure, endothelial cell count, endothelial changes, PCR results, and presence of glaucoma.

Results: Eleven eyes with presumed PSS were tapped, of which 3 (27.3%) were CMV-positive. All the CMV-positive patients were HIV negative. Significant corneal endothelial cells loss was noted in CMV-positive patients (p < 0.0001). All the CMV-positive patients did not show any sign of corneal endothelitis or anterior uveitis when glaucoma surgery was underwent. But one eye showed active corneal endothelitis after trabeculectomy, and systemic ganciclovir treatment has been administered.

Conclusions: There is a significant correlation between CMV-positive eyes and corneal endothelial cell loss in presumed PSS. From our results, despite without any clinical sign of corneal endothelitis or anterior uveitis, marked corneal endothelial cells loss might indicate CMV infection in presumed PSS patients.

P385 INCIDENCE AND MANAGEMENT OF SILICON OIL ASSOCIATED GLAUCOMA

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Purpose: To determine the incidence and clinical features of chronic elevated intraocular pressure after pars plana vitrectomy and silicone oil injection for complicated retinal detachment, and to evaluate the clinical management of eyes with secondary glaucoma.

Methods: This was an observational consecutive case series of 450 eyes in 447 patients who were treated with pars plana vitrectomy and silicone oil injection. Patients who developed secondary glaucoma were treated medically with anti-glaucoma medications and surgically with glaucoma drainage

implants placed in an inferior quadrant. Main outcome measures were intraocular pressure, number of glaucoma medications, surgical success, and complications.

Results: Fifty-one of 450 eyes (11%) developed elevated intraocular pressure after pars plana vitrectomy and silicone oil injection whereas 399 eyes (89%) did not have a rise in intraocular pressure. Of the 51 eyes that developed elevated intraocular pressure, 40 (78%) were treated only with glaucoma medicines. Medical therapy reduced the intraocular pressure from a mean \pm SD of 26 ± 13.4 mmHg before treatment to 18 ± 9.1 mmHg after medical treatment ($p = 0.002$). The 11 of 51 eyes (22%) with elevated intraocular pressure that failed medical therapy were treated surgically with Ahmed Glaucoma Valve implantation within 12 months of silicone oil injection. In the surgical group, intraocular pressure was reduced from a mean \pm SD of 44 ± 11.8 mmHg before surgery to 14 ± 4.2 mmHg at the most recent follow-up after surgery ($p < 0.001$). the number of anti-glaucoma medications was reduced from 3.5 ± 0.7 before surgery to 1.2 ± 0.5 at the most recent follow-up after surgery ($p < 0.001$).

Conclusion: Chronic intraocular pressure elevation occurs in a minority (11%) of patients who are treated with silicone oil. Most of these eyes are effectively treated with anti-glaucoma medications. Eyes that do not respond to medical therapy may be effectively managed with glaucoma drainage implant placement in an inferior quadrant.

P386 SECONDARY PDS FOLLOWING PHACOEMULSIFICATION WITH IMPLANTATION WITHIN THE 'CAPSULAR BAG' OF HYDROPHOBIC ACRYLIC INTRAOCULAR LENS (HOYA I-SERT)

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Background: The purpose is to report the case of a 36 yr old Indian myopic male with h/o radial keratotomy OU, who developed secondary PDS with severe elevation of IOP 14 days after unilateral uncomplicated phacoemulsification with implantation within the 'capsular bag' of hydrophobic acrylic intraocular lens (Hoya i-sert).

Methods: Complete ophthalmological examination and Pentacam examination of anterior segment was performed.

Results: The patient developed severe anterior segment PDS in R/E with elevated IOP of 60 mmHg with deep AC post phacoemulsification. Gonioscopically, heavy trabecular meshwork pigmentation with open angles was observed. No evidence of pigment dispersion in the other eye was seen. IOP remained elevated despite topical and systemic anti-glaucoma medication. Pentacam of anterior segment revealed irido-lenticular touch. Subsequently LI was done and IOP controlled on 2 anti-glaucoma drugs.

Conclusion: Phacoemulsification with IOL implantation may lead to secondary PDS with IOP elevation, even with IOL correctly placed within the capsular bag.

P387 CAROTID-CAVERNOUS SINUS FISTULA AND OCULAR HYPERTENSION

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Background: Carotid cavernous fistula (CCF) is an abnormal communication between the cavernous sinus and the carotid arterial system. A CCF can be due to a direct connection between the cavernous segment of the internal carotid artery and the cavernous sinus, or a communication between the cavernous sinus, and one or more meningeal branches of the internal carotid artery, external carotid artery or both. CCF is frequently accompanied by a variety of ocular symptoms and complications, such as conjunctival hyperemia, congestion of the retinal veins, occlusion of the retinal veins, vascular bruits, and external ophthalmoplegia, and it is known to frequently lead to ocular hypertension (OHT) and secondary glaucoma.

Methods: We report 2 cases of CCF complicated by IOP elevation.

Results: Two female patients aged respectively 53 and 59 years, presented with unilateral proptosis with red eye, and orbital pain. For the first patient, visual acuity (VA) was 20/20. Ophthalmic examination showed conjunctival chemosis, IOP was 30 mmHg with normal cup/disc. For the second patient VA was 20/25, IOP was 50 mmHg. Fundus examination showed glaucomatous cupping. Magnetic resonance imaging with arteriography confirmed CCF in both patients. The first patient underwent intracranial embolization resulting in IOP control. The second patient was treated by topical antiglaucomatous medication and systemic anticoagulant treatment. Two months after, deep sclerectomy was performed for uncontrolled OHT.

Conclusion: OHT and secondary glaucoma are common ocular manifestation of CCF. OHT occurred in over 64% of patients with ocular involvement, ranging from 22 to 55 mmHg. OHT and secondary glaucoma may be due to increased episcleral pressure and vortex venous pressure. Closure of the fistula is the primary condition to control the OHT, with some exceptions, in which case, filtering surgery may be necessary.

P388 CLINICAL PATHOLOGICAL ANALYSIS OF A CASE OF INTRAEPITHELIAL GLAUCOMA

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Objective: Exploring of the pathogenesis and risk factors of glaucoma secondary to trauma through analysis of clinical data and ocular pathological observation of one patient with traumatic glaucoma. Analysis of the mechanisms of high intraocular pressure through observation of the pathological and immunohistochemical changes of the Ahmed glaucoma valve encapsulation.

Method: One eye with traumatic glaucoma through several traumatic surgeries and twice Ahmed glaucoma valve implantations was observed with histopathology and immunohistochemical methods of TGF-1, TGF-2 and collagen (I, II, III and IV).

Results: One to several layers of non-keratinized squamous epithelial cells were observed at the posterior cornea, anterior chamber angle and iris surface, which were Alcian blue staining positive and originated from conjunctiva. Pathological diagnosis: intraepithelial glaucoma. The encapsulation tissue

above Ahmed valve was rich in neovascularization and focal lymphocytic infiltration at surface layer and dense collagen fibers at deep layer. Immunohistochemistry showed: TGF- β 1 and collagen type I, III's expression increased.

Conclusion: Multiple eye surgeries and continuing low intraocular pressure for half a month is the main reason for endogenous epithelium of the case, mechanism of glaucoma is the blocking drainage of aqueous humor by endogenous epithelial membrane covering the trabecular meshwork. Ahmed valve encapsulation is the main mechanism of high intraocular pressure after implantation and it is composed mainly of type I, III collagen. TGF- β 1 plays an important role in filtering bleb scarring.

P389 ASSOCIATION BETWEEN STEROIDS AND OCULAR SIDE EFFECTS, AN OVERVIEW

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Background: Steroid treatment has gained notoriety due to its tendency to induce multiple side effects, including a variety of ocular side effects. Administration of local, regional, inhalation or systemic steroids may induce the development of ocular hypertension, which might even result in subsequent open-angle glaucoma. About one in every three people is considered a potential 'steroid responder'.

Method: Patients on local steroids must undergo a thorough ophthalmic examination including tonometry, visual fields and optic disc examinations. A significant elevation of intraocular pressure might result in these patients in response to steroid treatment. Included in this group are patients with first degree relatives suffering from open-angle glaucoma.

Result: Morphologic changes in the trabecular meshwork (which serves as the site of aqueous humor drainage from the eye) are suggested as the proposed mechanism through which steroid treatment results in glaucoma. Steroids are said to induce the expression of a gene that is located on chromosome 1 and is known as TIGR or GLCIA. Its product is a protein called myocilin.

Conclusion: Ocular hypertension secondary to steroid treatment is usually reversible, when treatment is limited to a period of less than 12 months. The fear of ocular hypertension, which is usually unnoticed by the patient, obligates regular ophthalmologic follow-up examinations, including tonometry, visual fields and optic disc examinations.

P390 BIOMETRIC ANALYSIS OF PIGMENT DISPERSION SYNDROME USING ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

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Background: To compare anterior chamber volume, iris volume and iridolenticular contact area before and after laser peripheral iridotomy (LPI) in eyes with pigment dispersion syndrome (PDS), using anterior segment optical coherence tomography (AS-OCT) and image processing software.

Methods: Cross-sectional study in 18 eyes of 18 patients with PDS and 30 eyes of 30 controls matched for age, sex

and refraction. AS-OCT imaging was performed in all eyes before LPI and 1, 4 and 12 weeks after. At each visit, 12 cross-sectional images of the AS were taken: 4 in bright conditions with accommodation (accommodation), 4 in bright conditions without accommodation (physiological miosis) and 4 under dark conditions (physiological mydriasis). Biometric parameters were estimated using AS-OCT radial sections and customized image-processing software. Main outcome measures: Anterior chamber volume, iris volume to length ratio, iridolenticular contact area, AS-OCT anterior chamber depth and A-scan ultrasonography axial length.

Results: Before LPI, PDS eyes had a significantly greater anterior chamber volume and iridolenticular contact area than control eyes ($p < 0.01$), and a significantly smaller iris volume to length ratio than the controls ($p < 0.05$). After LPI, anterior chamber volume and iridolenticular contact area decreased significantly in PDS eyes, but iris volume to length ratio increased significantly ($p < 0.02$), and was not significantly different from that of controls. These biometric changes were stable over time. Iris volume to length ratio decreased significantly from accommodation to mydriasis and from miosis to mydriasis, both in PDS and control eyes ($p < 0.01$). In PDS eyes, iridolenticular contact area decreased significantly from accommodation to mydriasis, both before and after LPI ($p < 0.01$). On multivariate analysis, greater AC volume ($p < 0.02$) and larger AC depth ($p < 0.05$) before LPI were significant predictors of a larger iridolenticular contact area.

Conclusions: PDS eyes do not have an iris that is abnormally large, relative to the anterior segment size, but have a weakly resistant iris that is stretched and pushed against the lens when there is a pressure difference across the iris.

P391 DIABETIC GLAUCOMA: FEATURES OF CLINIC AND TREATMENT

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The Purpose: An estimation of efficiency of drainage surgery secondary new vascular the complicated (diabetic) glaucoma at patients with a diabetes mellitus (DM).

Methods: 44 patients (46 eyes) have been included in research with the diagnosis a diabetic glaucoma (24 men + 20 women), middle age – 62.6 ± 6.9 years, an average level glycohemoglobin – $8.0 \pm 1.7\%$. The average level of intraocular pressure before operation has made 42.6 ± 3.3 mm rt. st. At all patients has been executed operation with implantation of valves of Ahmed (41 eyes) and Molteno (5 eyes).

Results: After operation at all patients the painful syndrome has been stopped and received proof intrapression tension (17.8 ± 2.1 mm rt. st.). In the early postoperative period have been marked: gifema (18 eyes – 39%), cataract (3 eyes of-6.5%), reduction of depth of the forward chamber of an eye (2 eyes – 4.3%), ablatio choroideus (1 eye of-2.1%). In the late postoperative period: «capture» of iris (2 eyes – 4.3%), a vascular corneal spot (1 eyes – 2.1%), a dystrophy of cornea (1 eyes – 2.1%).

Conclusion: The diabetic glaucoma is an objective reality. The drainage surgery diabetic (secondary newvascular) glaucoma and her complications should become «the gold standard» treatments of this pathology at patients with a diabetes.

P392 SUSTAINED INTRAOCULAR PRESSURE ELEVATION IN PATIENTS UNDERGOING INTRAVITREAL ANTI-VASCULAR ENDOTHELIAL GROWTH FACTOR TREATMENT: A CASE SERIES

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Background: To document cases of unilateral sustained elevation of intraocular pressure (IOP) while receiving courses of intravitreal anti-vascular endothelial growth factor (VEGF) agents.

Methods: A retrospective analysis of all cases managed by the authors and colleagues was performed.

Results: Seven patients developed sustained IOP rises while receiving intraocular anti-VEGF injections, four of whom required glaucoma filtering surgery. Ranibizumab was used in four cases while three received bevacizumab. Four patients received unilateral and three bilateral anti-VEGF agents. Two had a past history of primary open angle glaucoma and one of pseudoexfoliative glaucoma, all of whom had stable IOP on topical pharmacotherapy prior to anti-VEGF treatment. Angles were open with one exception of narrow angles but no pre-existing glaucoma or elevated IOP. Peak IOPs averaged 43 mmHg, ranging from 27-60 mmHg. Four patients required trabeculectomy, two SLT and the remainder multiple topical medication to control the IOP elevation.

Conclusions: A sustained rise in IOP requiring multiple glaucoma medications and/or glaucoma filtering surgery is a rare but potentially important treatment complication for patients receiving intravitreal anti-VEGF therapy, especially those with pre-existing glaucoma or glaucoma risk factors. Proposed mechanisms include direct toxicity to trabecular meshwork (TM) cells, TM obstruction by aggregates of anti-VEGF antibody or antibody fragments, and TM obstruction by silicone contaminants from the syringe or rubber stopper.

P393 SECONDARY OPEN-ANGLE MEDICAMENTOUS GLAUCOMA WITH END-STAGE CAMPIMETRIC CHANGES IN NAIVE PATIENT

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Background: Cortisone glaucoma is classified in the secondary iatrogenic glaucoma group and clinically is indistinguishable from a simple primary open-angle glaucoma. Ocular hypertension in these patients occur as a consequence of the increased resistance of aqueous outflow due to trabecular changes. Elevated intraocular pressure (IOP) usually is reversible if corticosteroids are withdrawn, but the anatomical changes in the drainage system may become irreversible if the use is prolonged. This fact indicates that sometimes the IOP may remain elevated despite discontinuation of the treatment and requires from the ophthalmologist to start administering medical therapy or even surgical – in some patients.

Methods: A 73 years old male patient underwent a first visit examination referring the 'foreign body sensation' in both eyes over several months. The visual acuity (VA) was 0,4 in

the right eye and 0,6 in the left eye. The IOP was 40 mmHg in both eyes. In the anterior segment there was a marked chronic posterior blepharitis and correct bilateral pseudophakia. To relieve the discomfort of the blepharitis, the patient was self medicated for 4 years with the treatment that prescribed his ophthalmologist at its last visit – a steroid treatment. The appearance of the optic nerve head revealed an advanced 'edge to edge' cupping, very thin neuroretinal rim, beta parapapillary chorioretinal atrophy and marked double angulations of the blood vessels that followed the morphological lines of the excavation. The visual field (VF), with excellent reliability indices showed well established deep scotoma, leaving only a central isle of unaffected vision.

Results: Two weeks after the suspension of the steroid treatment the IOP decreased to 24 mmHg, and with the addition of topical hypotensive treatment – a prostaglandin analogue – the pressure stabilized at 12 mmHg. During the next two years deterioration in the VF appearance was not observed.

Conclusions: Cortisone glaucoma is a serious complication of the topical corticosteroid treatment which can lead to severe functional damage of the optic nerve. Physicians and patients should be educated and warned about the potential risks of the prolonged and not monitored use of the topical corticosteroid therapy.

Clinical Glaucoma: Angle Closure Glaucoma

P394 PRIMARY PHACOEMULSIFICATION AND INTRA-OCULAR LENS IMPLANTATION FOR ACUTE PRIMARY ANGLE CLOSURE

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Background: To investigate the effect of primary phacoemulsification on intraocular pressure (IOP) lowering in patients with acute primary angle-closure (PAC) and coexisting cataract.

Methods: 16 eyes of 14 patients with acute PAC received phacoemulsification and intraocular lens implantation as an initial management for medically uncontrolled IOP. The effect on IOP control, vision improvement, changes in the anterior chamber depth and the number of anti-glaucoma medications were evaluated.

Results: The post-operative IOP was reduced in 16 eyes (100%). The mean pre-operative IOP was 48.81 ± 16.83 , which reduced to 16.46 ± 10.67 mmHg (one day, $p < 0.001$), 9.43 ± 3.03 mmHg (one week, $p < 0.001$), 9.49 ± 2.14 mmHg (two weeks, $p < 0.001$), 10.78 ± 3.56 mmHg (one month, $p < 0.001$), and 10.70 ± 2.80 mmHg (three months, $p < 0.001$) respectively. The mean number of anti-glaucoma medications decreased from 3.56 ± 1.14 to 0.13 ± 0.34 ($p < 0.001$). The averaged pre-operative ACD was 2.08 ± 0.35 mm, and increased to 3.59 ± 0.33 mm after the surgery ($p < 0.001$). Visual acuity (converted into logarithm of the minimum angle of resolution, logMAR) improved from 1.14 ± 0.71 to 0.73 ± 0.53 ($p = 0.001$).

Conclusion: Primary phacoemulsification plus IOL implantation lowered IOP, diminished the use of anti-glaucoma med-

ications and improved vision in patients with acute PAC. It is a safe and effective way in IOP control and can be considered as a first treatment option in managing patients with acute PAC and coexisting cataract.

P395 COMPARISON OF ACUTE PRIMARY ANGLE-CLOSURE EYES WITH FELLOW EYES USING ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

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Background: To compare eyes with acute primary angle closure (APAC) with fellow eyes using anterior segment optical coherence tomography (ASOCT prototype, Carl Zeiss Meditec, Dublin, CA).

Methods: This was a prospective comparative case series. 27 consecutive patients with APAC were recruited from National University Hospital (Singapore). ASOCT imaging of the anterior segment was performed before treatment was administered, and the nasal-temporal scans were analyzed. Custom software (Anterior Segment Analysis Program, ASAP, National University Health System, Singapore) was used to measure the pupil diameter (PD), anterior chamber depth (ACD), anterior chamber width (ACW), anterior chamber area (ACA), iris curvature (I-Curv), and the angle opening distance (AOD500), angle recess area (ARA500), trabecular iris space area (TISA500), iris area (IA500) and iris thickness (IT500) at 500µm from the scleral spur.

Results: The mean age of the patients was 60.9 ± 7.5 years, and 11 patients (40.7%) were male. The mean IOP was 54.4 ± 10.0 mmHg in the APAC eye, and 12.7 ± 6.6 mmHg in the fellow eye. APAC eyes had a smaller I-Curv compared to fellow eyes (0.16 ± 0.08 vs 0.29 ± 0.10 mm, $p < 0.001$), but there was no significant difference in PD, ACD, ACW, ACA, AOD500, ARA500, TISA500, IA500 and IT500 between APAC eyes and fellow eyes (all $p > 0.05$).

Conclusion(s): APAC eyes had a smaller I-Curv compared to fellow eyes, but there were no significant differences in other anterior segment parameters between APAC eyes and fellow eyes.

P396 PENETRATING OCULAR TRAUMA PRESENTING WITH ACUTE ANGLE-CLOSURE GLAUCOMA

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Background: Penetrating eye traumas are usually associated with ocular hypotony which is considered as an indirect open globe injury sign and can be evaluated during primary care. Ocular hypertension as presenting feature of penetrating ocular trauma has not been described. We report a case of penetrating eye injury presenting with shallow anterior chamber and hitherto undescribed paradoxical intraocular hypertension.

Methods: A case report.

Results: A 23-year-old man presented with an acute right eye pain and loss of vision following a right eyebrow injury with a palm tree spine. Slit lamp biomicroscopy of the right eye revealed a shallow anterior chamber. Intraocular pres-

sure (IOP) was 46 mmHg. The fundusoscopic examination and ultrasonography showed a vitreous hemorrhage and a choroidal detachment. A posterior scleral entrance wound with choroidal extruding was found out and has been sutured. One day later, IOP became normal and the anterior chamber deepened.

Conclusion: Post-traumatic intraocular hypertension should not rule out a perforating ocular trauma.

P397 EVALUATION OF BIOMETRIC VARIABLES IN DIFFERENT MECHANISMS OF PRIMARY ANGLE CLOSURE

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Background: Primary angle-closure glaucoma (PACG) is a major cause of blindness in Asia. Early detection of the underlying mechanisms for primary angle closure (PAC) and PACG is vital in appropriate management of these patients. Studies have shown that anterior chamber depth (ACD), lens thickness and more anteriorly positioned lens have been considered as important biometric determinant in primary angle closure glaucoma. Also, it has been reported that lens thickness (LT)/axial length (AL) ratio in eyes with narrow anterior chamber angles is useful in establishing which eyes are more prone to develop angle-closure glaucoma. Hence, the aim of this study was to determine if the biometric variables such as ACD, AL, LT, Lens position (LP), relative lens position (RLP) and Lens Vault (LV) could be used to categorize PAC and PACG into different mechanisms of angle closure.

Methods: 148 patients (148 eyes) with PAC and PACG were recruited from National University Health System, Singapore. All patients underwent complete ophthalmic examination. Nasal-temporal images of the anterior segment were captured under dark conditions using Anterior Segment Optical Coherence Tomography (ASOCT). With consensus of 4 glaucoma experts the images were categorized into 4 groups based on the mechanism of angle closure. When images showed more than one mechanism the major mechanism of angle closure was established by majority of votes cast by the experts. 51 eyes with pupil block, 23 eyes with Plateau Iris (PI), 21 eyes with thick Peripheral Iris Roll (PIR) and 53 eyes with Large Antero-posterior Lens Diameter (LAPLD). ACD, AL and LT were measured by A-Scan. $LP = ACD + LT/2$ (mm), $RLP = LP/AL$, LV (perpendicular distance between the anterior lens surface and the mid-point of an imaginary line drawn through both scleral spurs) were calculated.

Results: The subjects were 87% Chinese and 65% females. Mean age was 68.3 ± 9.8 years. Using one-way ANOVA, significant difference in ACD ($p = 0.033$), AL ($p = 0.017$) and LV (< 0.001) was found between the groups. There was no difference in LT, LP, and RLP. Multivariate analysis showed that LV was thickest in eyes with exaggerated lens vault and thinnest in eyes with plateau iris and ACD was deepest in eyes with plateau iris and shallowest in eyes with exaggerated lens vault as compared to pupil block mechanism.

Conclusion: Biometric parameters such as ACD and LV may be useful in categorizing eyes into different mechanisms of angle closure. Lens position and relative lens position are not sensitive enough to categorize eyes into different mechanisms of angle closure.

P398 APPositional ANGLE CLOSURE IN CHINESE PATIENTS WITH PRIMARY ANGLE CLOSURE AND PRIMARY ANGLE-CLOSURE GLAUCOMA AFTER LASER PERIPHERAL IRIIDOTOMY

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Purpose: to determine the prevalence of appositional angle closure (AAC) after laser peripheral iridotomy (LPI) in Chinese patients with primary angle closure (PAC) and primary angle closure glaucoma (PACG) and to evaluate the pathogenesis by investigating anatomic characteristics.

Methods: In this cross-sectional observational study, consecutive patients with PAC and PACG after LPI underwent UBM in darkness. Darkroom provocative tests (DRPT) were performed for those with normal IOP. UBM images of each quadrant without peripheral anterior synechia (PAS) under gonioscopy was qualitatively assessed.

Results: 134 eyes of 134 patients were enrolled. AAC was observed in at least 1 quadrant of UBM images in 85 subjects (63.4%), and in at least 2 quadrants in 39 subjects (29.1%). Plateau iris was found in at least 1 quadrant in 49 subjects (39.6%) and in at least 2 quadrants in 13 subjects (9.7%). There were 459 quadrants of 134 patients without PAS. Among these, AAC existed in 143 quadrants (31.2%). Of these 143 quadrants, plateau iris only accounted for 42.7% (61/143), distally inserted iris alone for 16.1% (23/143), thick iris alone for 11.1% (16/143), and anterior inserted iris combined with thick iris for 20.3% (29/143). 115 subjects underwent DRPT. Positive rate of DRPT of eyes with AAC in 2 or more quadrants (27.8%, 20/72) was significantly higher than those in 0 or 1 quadrant (14.0%, 6/43) ($p = 0.018$). However, no significant difference in DRPT positive rate was found between eyes with plateau iris in 0 or 1 quadrant (21.2%, 22/104) and those in 2 or more quadrants (36.4%, 4/11) ($p = 0.251$).

Conclusion: About two thirds of PAC and PACG eyes of Chinese patients after LPI had AAC based on UBM findings. Plateau iris only accounted for less than half for it. Other factors such as a thick peripheral iris and a distally inserted iris contribute much more to it. DRPT results suggested AAC may have more functional meaning than plateau iris. Longitudinal studies are required to determine its clinical significance.

P399 EVALUATION OF ANTERIOR CHAMBER WIDTH AND LENS VAULT AS RISK FACTORS FOR ANGLE CLOSURE IN JAPANESE

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Background: Anterior Chamber Width (ACW) and Lens Vault (LV) were recently identified as new potential risk factors for angle closure in Chinese Singaporeans. The purpose of our study was to investigate the association of these parameters with angle closure in Japanese subjects.

Methods: Eighty-seven Japanese subjects with angle closure (consisting of 51 primary angle closure (PAC), 36 primary angle-closure glaucoma (PACG)) with laser peripheral iridotomy performed attending glaucoma clinics and 68 normal Japanese subjects with open angles and no evidence of

glaucoma recruited from comprehensive ophthalmology services. All participants underwent gonioscopy and AS-OCT (Carl Zeiss Meditec, Dublin, CA). Customized software was used to measure LV and ACW. A-scan biometry (US-800; Nidek Co, Ltd, Tokyo, Japan) was used to measure LT and to calculate LP and RLP.

Results: There were significant differences between angle-closure and normal eyes were found for all the parameters. After adjusting for age, gender, ACD, LT, and RLP, increased LV was associated significantly with angle closure (odds ratio [OR], 78.8; 95% confidence interval [CI], 6.4 – 965.3, comparing lowest to highest quartile). LV had the highest AUC (0.96), higher than any other parameters including ACW.

Conclusions: Eyes with angle closure have shown greater LV compared with normal eyes. The LV, which represents the anterior portion of the lens, is a novel parameter strongly associated with angle closure in Japanese after adjusting for age, gender, ACD, and LT.

P400 A CASE REPORT OF MALIGNANT GLAUCOMA AFTER TRABECULECTOMY AND ITS ALTERNATIVE IMMEDIATE TREATMENT

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Background: To present a case report of malignant glaucoma which occurred six days after trabeculectomy in patient with primary angle closure glaucoma.

Methods: Case report.

Results: A 46 year woman with primary angle closure glaucoma was treated with local anti-glaucomatous drops. Laser iridotomy and argon laser peripheral iridoplasty were performed as well. After all these procedures were done, during the last six months, the progression on perimetry with increased intraocular pressure has been observed. The patient described her troubles as hazy vision and a headache in the evenings. Following this finding we decided to perform a trabeculectomy. The procedure and postoperative period did not present any extraordinary findings. However elevated intraocular pressure (70 mmHg) was measured on the sixth day check. The anterior chamber was significantly flattened almost vanished and the patient had a headache. Malignant glaucoma was diagnosed. During hospitalization the infusions of mannitol with combination of local anti-glaucomatous and mydriatic and cycloplegics drops were applied. During the second day of hospitalization laser cyclophotocoagulation with diode laser was performed. This procedure led back to normal findings, resulting in a deepening of anterior chamber and intraocular pressure stabilized at normal range levels.

Conclusion: These findings represent a very interesting case report of early treatment of malignant glaucoma with diode laser cyclophotocoagulation, which occurred as the definitive, prompt and minimal invasive resolution in this case.

P401 ACUTE BILATERAL ANGLE-CLOSURE GLAUCOMA SECONDARY TO TOPIRAMATE USE

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Amongst drugs, sulphonamide and its derivatives have been documented to cause transient myopia, ciliary body edema, uveal effusions and anterior rotation of the lens-iris diaphragm causing secondary acute angle closure glaucoma. Topiramate, a sulfamate-substituted nature monosaccharide. We report a case of acute progressive myopia, uveal effusion and bilateral angle closure glaucoma due to Topiramate – a drug used for migraine prophylaxis. 33 year old female presented with severe headache and ocular pain associated with loss of vision for last 3 hours. The biomicroscopic examination showed conjunctival hyperemia in both eyes, narrowing of the anterior chamber, and closure of the iridocorneal angle. Intraocular pressure was 68 mmHg on the right and 70 mmHg on the left. Refractive error was -9.00 D in both eyes. Patient had no prior history of glaucoma but had a history of migraine and was started with topiramate acetate just one day prior to admission. The topiramate treatment was stopped. The patient was administered topical anti-glaucomatous agents, topical cyclopentolol, and oral carbonic anhydrase inhibitors. On the third day of the treatment, visual acuity, intraocular pressure, gonioscopic and myopic findings returned to normal. Due to the potential ophthalmic side effects of topiramate, patients should be warned prior to drug initiation.

P402 BILATERAL ACUTE ANGLE CLOSURE GLAUCOMA CAUSED BY FLUOXETINE. A CASE REPORT

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Background: Acute angle closure glaucoma (ACG) occurs in patients with narrow iridocorneal angle, being more prevalent in elderly, hyperopic and Asian. Mydriasis, induced by factors such as darkness, stress or drugs, may be a triggering factor of this disease.

Methods: Case report of a 55 years old patient, female, black, with history of depressive mood that one month after initiation of oral fluoxetine therapy, appears in the emergency department with bilateral condition of intense eye pain, tearing, photophobia, decreased vision, nausea and vomiting. Ophthalmological exam showed corneal edema, conjunctival injection, mid mydriasis, narrow anterior chamber (AC) and IOP of 58 mmHg OD and 47 mmHg in OS. After systemic therapy with intravenous mannitol, oral acetazolamide and topical pilocarpine, the transparency of the cornea improved, allowing us to perform bilateral iridotomy. Later, the patient underwent Pentacam exam, OCT RNFL and computerized perimetry.

Results: After therapy, there was complete recovery of the symptoms, with stabilization of IOP at 10-12 mmHg OU. Gonioscopy revealed a narrow iridocorneal angle, grade II in Shaffer's classification, corroborated by the Pentacam exam. The OCT showed a pathological decrease of the nerve fiber layer in the upper OD and suspicion in the upper OS. Perimetry also revealed changes in threshold sensitivity, especially in the right eye.

Conclusions: We concluded this to be a case of bilateral AACG, probably induced by fluoxetine, a selective serotonin reuptake inhibitor (SSRI). Some studies refer that there are serotonergic receptors in the iris-ciliary body complex which, once stimulated, could lead to pupil sphincter muscle relaxation. Thus, the increased serotonin levels associated with

the anticholinergic effects inherent to these agents, appears to be an important factor in inducing mydriasis, triggering AACG in patients with predisposing ocular anatomy. The growing number of AACG cases associated with fluoxetine, paroxetine and venlafaxine reported in the literature in recent years, shows that may be important an ophthalmological exam before initiating treatment with SSRIs, to exclude a narrow angle AC in these patients.

P403 DELAYED SEVERE ELEVATION OF IOP DUE TO BILATERAL SECONDARY ANGLE CLOSURE FOLLOWING INTRAOCULAR PROSTHETIC COLORED IRIS IMPLANTATION

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Background: Single piece silicone iris implants, originally developed to correct congenital or traumatic aniridia, have recently been used in cosmetic procedures to change the eye colour in patients with normal intact irides. No long-term safety studies for this technique have been published. There have been case reports describing complications in the early postoperative period, but there have been no reports of delayed complications to date.

Methods: This is the first case report of delayed bilateral severe elevation of intraocular pressures (IOPs) due to secondary angle closure following intraocular prosthetic colored iris implantation.

Results: A 41-year old woman was referred urgently for elevated IOPs to the Glaucoma Unit. The patient had previously undergone bilateral implantation of cosmetic prosthetic irides 18 months prior to presentation. She had no other ocular history. There was a family history of glaucoma and glaucoma blindness. Her visual acuities were 6/9 right and left with IOPs of 40 mmHg bilaterally. Horizontal corneal diameter measurements were reduced at 10.5 mm right and left. There were diffuse pigment deposits on both corneal endothelia. There was no active intraocular inflammation in either eye. Gonioscopy revealed complete secondary angle closure due to 360 degree implant-angle apposition. Fundal views were limited due to small pupil size of the implants (3 mm). The cup-disc ratios were 0.75 with superior rim thinning in the right eye, and 0.65 in the left. Ultrasound biomicroscopy (UBM) scan showed anterior iris insertion and marked iris stromal thinning associated with iris-implant contact. The axial length measurements were 22.3mm bilaterally. Despite maximally tolerated medical therapy (MTMT) including oral acetazolamide, IOPs remain elevated. Sequential bilateral surgical explantations were performed. The implants were found to be adherent to the iris. However they were removed without complications, though with great difficulty. There was marked fibrinous reaction despite intensive topical steroid therapy in the immediate postoperative period. At one month postoperatively, IOPs were 10mmHg bilaterally on g. latanoprost nocte, g. brinzolamide tds and oral acetazolamide 250mg bd. She was also on g. dexamethasone 0.1% preservative-free five times a day to control intraocular inflammation.

Conclusion: Intraocular prosthetic iris implantation in patients with normal intact irides can have serious and potentially sight-threatening complications. We report the first case of delayed severe IOP elevation due to secondary angle clo-

sure following the implantation. Some eyes are at higher risk for complications, particular those with a narrow drainage angle, a small anterior segment or a short axial length. Removal of these implants in delayed cases is a high risk procedure as these implants are often adherent to intraocular structures such as the iris or the drainage angle. Patients need to be aware of potential complications of this elective intraocular cosmetic procedure.

P404 REPORT OF A CASE OF DRUG RELATED BILATERAL ACUTE ANGLE-CLOSURE GLAUCOMA

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Background: To report a case of acute attack of bilateral angle closure glaucoma in a patient receiving Topamax tablets 25 mg 12 hourly for 3 weeks

Methods: patient presented to Emergency department complaining of bilateral sudden diminution of vision of 6 hours before presenting to Emergency departement + bilateral eye pain. PH of HTN of 1 year duration on medication. PH of repeated attacks of migraine on treatment as well. Patient went to Attraction park 1 day before. On Examination: VR: 6/60 ; VL: 5/60; IOP: 36 – 44 mmHg ; Cornea: mild epith edema mild epith edema; AC: shallow at the periphery (BE); Pupil: round, regular, slightly dilated, sluggish reaction; Fundus: C/D 0.3 0.3; Optic disc and macula: within normal PH of eye check up 1 year before revealed no abnormality with vision of 6/6 (OU), normal IOP and open angles by gonioscopy. Patient was admitted to hospital and received: Stat Diamox injection IV 500 mg; Pilocarpine eye drops ev 10 min for 5 times then 6 hourly; IV Mannitol 20% 200 ml twice; Dorzolamide + timolol eye drop 12 hourly; Travatan eye drop; once/day; Diamox tablets 250 mg 6 hourly; Pt was asked to stop and bring all systemic medications. Next day: IOP 28 – 32 mmHg; VR 6/36 VL 6/60; Cornea: clear clear; AC: severly shallow lost at the periphery both eyes; Pupil: narrow (BE); Gonioscopy: closed angle grade 0 (OU); Fundus: 0.5 0.5; Pt was using Bisoprolol 2.5 mg once daily for HTN for 1 year; Topamax TB 25 mg 12 hourly for 3 weeks (both stopped since admission); 2 day after treatment: VA same IOP 12 12 mmHg; AC: getting better, deeper; Treatment decreased 3 days after: VA 6/6 6/6; IOP: 12 12 mmHg; AC: normal depth. Gonioscopy was done and found to be open in both eyes.

Results: Bilateral acute angle closure glaucoma related to systemic medication Topamax (Topiramate) tablet.

Conclusion: Acute angle closure glaucoma has been identified as adverse reaction to Topiramate ,This syndrome may be associated with supraciliary effusion resulting in anterior displacement of the lens and iris, with secondary angle closure glaucoma. Symptoms typically occur within 1 month of initiatingWe report a case of bilateral acute attack of angle closure glaucoma after Topamax Tablet for 3 weeks . It seems that the attack is not related to previously occludable angle as this patient had open angle before and after the attack. It is also important that all patients receiving this drug to have ophthalmological examination before and more important after commincemt of treatment in the first 4 weeks and patient should be informed about ocular side effects , this is of great importance to avoid raised IOP with subsequent damage to optic nerve

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P405 OBJECTIVE ASSESSMENT OF PROGRESSION AFTER ACUTE PRIMARY ANGLE CLOSURE USING MULTIPLE MEASUREMENTS

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Background: Despite the development and establishment of state-of-the-art retinal imaging technology, there is a lack of good clinical studies assessing objective changes in patients following an attack of acute primary angle closure (APAC). The aim of this study was to prospectively assess, using different objective imaging parameters, the progression of patients following APAC.

Methods: Twenty patients with a single attack of APAC presenting to the Western Eye Hospital in London were prospectively enrolled in this study. Patients were assessed with Heidelberg Retinal Tomography (HRT3), Scanning Laser Ophthalmoscopy (GDx-VCC) and Spectral Domain Optical Coherence Tomography (SD-OCT) as well as Humphrey Visual Field (HVF) repeatedly from within a month of the acute attack to up to eighteen months follow-up. Progression for each imaging modality was assessed with multiple parameters including for HRT (5): rim area, rim volume, mean RNFL thickness, linear cup-to-disc ratio and Glaucoma Probability Score (GPS); for GDx (5): TSNIT, Superior and Inferior Averages, TSNIT Standard Deviation and Nerve Fiber Index (NFI); and for the OCT (2): RNFL thickness profile and retina thickness map. Repeated imaging was performed in all patients.

Results: All patients showed changes over time in both RNFL and optic disc assessment. At 18 months, 67% of patients showed progression in 4/5 GDx parameters, and 33% in all 5. HRT analysis similarly showed progression in 4/5 parameters in 70% of patients, and 30% in all 5. OCT showed similar results.

Conclusions: This study shows that progressive changes in both HRT and nerve fiber layer analysis occur following APAC. As far as we are aware, this is the first prospective longitudinal study where multiple imaging modalities have been used to provide objective measurements of changes. It confirms that APAC patients need long-term follow-up after the acute attack.

P406 CORNEAL INDENTATION IN THE EARLY MANAGEMENT OF ACUTE ANGLE CLOSURE

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Background: Acute angle closure (AAC) is increasingly recognized as a major concern, particularly in our Asia Pacific region. Its management is crucial to long-term success in preventing glaucoma, aiming to relieve pain, lower IOP and enable further definitive treatment. We have trialed a simplified approach to early management with potential application in our region.

Methods: The management protocols for AAC in several hospitals and private clinics were reviewed to incorporate Corneal Indentation (CI) as an initial step, followed by conventional medical/laser/surgical techniques as appropriate. CI is performed according to our previously published method involving 3 cycles of 30 sec central or inferior indentation with glass rod or gonioscopy lens.

Results: CI was found to be easily added to the protocols with minimal training or additional resources required. The procedure was well tolerated and when successful in breaking the AAC the effect was dramatic. It was felt to be effective in relieving pain and achieving IOP reduction in a significant proportion of presentations, thus reducing the burden of standard topical and oral agents. Laser iridotomy was also able to be performed sooner in many as the corneal view improved.

Conclusion: CI is a useful addition to early AAC management protocols, being a simple, cheap and safe technique. It reduces, and may perhaps avoid, the need for protracted pharmaceutical treatment and may potentiate laser treatment. Further studies would be helpful in quantifying these perceived benefits, as this simple technique could be especially useful in developing nations with little additional cost.

Clinical Glaucoma: Glaucomas Associated with other Ocular and Systemic Disorders

P407 SECONDARY GLAUCOMA WITH CILIARY BODY TUMOR IN A PSEUDOPHAKIC EYE; MALIGNANT TRANSFORMATION OF A CILIARY BODY MELANOCYTOMA?: REPORT OF A CASE

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Background: To report a case in which melanocytoma of the ciliary body in a pseudophakic eye presented with elevated intraocular pressure (IOP).

Methods: A 62-year-old woman presented with increased IOP in her right eye. Visual acuity of the right eye was light-perception and the IOP was 44 mmHg. Slit-lamp examination and ultrasonography revealed a ciliary body mass with widespread pigment dispersion in the anterior segment. Because of no useful vision and uncontrolled pain, enucleation of the right eye was performed.

Results: The tumor had a gross finding of a heavily pigmented, soft, and smooth surface 1.0x0.8x0.7 cm in size. Histopathologic examination revealed a melanocytoma of the ciliary body and focal malignant transformation with extension of melanocytoma cells and macrophages into the trabecular meshwork and anterior chamber angle.

Conclusions: Melanocytoma of the ciliary body is a rare benign intraocular tumor. The association of glaucoma with

melanocytoma may be suggestive of a malignant change in the tumor.

P408 EFFECT OF INTRAVITREAL BEVACIZUMAB INJECTION ON TRABECULAR TISSUE OF NEOVASCULAR GLAUCOMA AND RETINAL FIBROVASCULAR MEMBRANE OF PROLIFERATIVE DIABETIC RETINOPATHY

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Background: Bevacizumab (Avastin®) is a full-length humanized anti-vascular endothelial growth factor (VEGF) monoclonal antibody that is approved for use in some countries, including Japan. It has also been increasingly used as an off-label therapy in ophthalmology. Recent clinical data of the intravitreal injection of bevacizumab (IVB) showed excellent results in the treatment of angiogenetic pathologies including neovascular glaucoma (NVG) and proliferative diabetic retinopathy (PDR). This injection may provide us with sufficient time to treat NVG patients with retinal photocoagulation. In addition, it may also be used as an adjunctive therapy for a mitomycin C (MMC) trabeculectomy to treat NVG. Bleeding from the retinal vessels or new vessels during a vitrectomy after IVB has been reported to occur significantly less frequently than that observed during a standard vitrectomy without bevacizumab therapy. IVB has also been reported to be effective in the regression of new vessels in PDR. The present study was carried out to examine the histology of the trabecular meshwork of NVG and fibrovascular membranes (FVMs) in PDR after an IVB.

Methods: A 1.25 mg (0.05 mL) IVB was given in the superotemporal quadrant 4 mm posterior to the limbus of the affected eyes. Three trabecular tissues obtained by a trabeculectomy and 6 fibrovascular membranes obtained during a pars plana vitrectomy were used as materials. Light and electron microscopic studies were carried out on surgical specimens. The presence and distribution of CD34 was assessed as a marker of vascular endothelium using immunostaining.

Results: The sections viewed under light microscopy contained Schlemm's canal, juxtacanalicular connective tissue, and almost all parts of the corneoscleral meshwork in all 3 NVG tissues. Capillary-like structures with few red blood cells were observed in the trabecular meshwork. Capillary-like structures with few red blood cells and a fibrous matrix containing a large amount of collagen and fibroblasts were observed in the FVMs. CD34 positively stained in the vascular endothelial cells consisting of the capillary-like structure in the trabecular meshwork (Fig.1) and FVMs (Fig.2). The electronmicroscopic study showed that there were several capillary-like structures consisting of a single layer of vascular endothelial cells in both the trabecular meshwork and FVMs. The layer of vascular endothelial cells demonstrated junctional complex. No fenestration was observed in the vascular endothelial cells.

Conclusions: The vascular endothelial cells are still present in the trabecular meshwork of NVG and FVMs of patients with PDR following IVB. A reduced number of fenestrations of the vascular endothelial cells may be one of the factors contributing to the clinical effects of IVB.

P409 A RARE COMPLICATION OF ZOLENDRONATE INFUSION LEADING TO GLAUCOMA FILTRATION SURGERY

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Background: To highlight a rare and potentially challenging, complication of zoledronate infusion: acute anterior uveitis (AAU) followed by raised intraocular pressure

Methods: Interventional case report.

Results: A 69-year-old Caucasian lady was started on the bisphosphonate zoledronate, as prophylaxis against osteoporosis. Within 48 hours of receiving her first zoledronate infusion she developed a painful, red, photophobic left eye. She was diagnosed with a severe anterior uveitis with corneal oedema and plus three cells with a secondary rise in the intraocular pressure (IOP) to 40. She had a past history of left episcleritis and had been diagnosed with primary open angle glaucoma 11 years earlier with advanced cupping bilaterally. She had already had glaucoma surgery in her fellow right eye and was known to be a steroid responder. During follow-up, IOP remained high over a 4-month period, fluctuating between 26 and 42, despite being on four anti-glaucoma medications. The challenge was that she required topical steroid to treat her uveitis in the background of known glaucoma and steroid response. She eventually underwent a left phacotrabeculectomy with 5-fluorouracil (5-FU 25 mg/ml). With a previous history of uveitis, not surprisingly, 4 weeks post-op she developed an encapsulated bleb with an IOP of 51 and underwent needling with 5FU. Four weeks post-needling an injected diffuse bleb was noted with persistently raised (26-33) IOP, with an element of steroid response. Her visual acuity remained stable at 6/6. Eventually IOP was controlled at 17 mmHg with no topical medication, careful post-op follow up, bleb massage and cessation for the need for topical steroids.

Conclusions: Caution should be exercised when prescribing bisphosphonates to glaucoma patients. A high index of suspicion is needed in patients with a red and painful eye after initiating bisphosphonate therapy.

P410 ABSTRACT WITHDRAWN

P411 A LONGITUDINAL ASSESSMENT OF CENTRAL CORNEAL THICKNESS AND INTRAOCULAR PRESSURE AFTER BILATERAL CONGENITAL CATARACT SURGERY IN EYES WITH AND WITHOUT IOL IMPLANTATION

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Background: Measurement of intraocular pressure (IOP) is often one of the only way to diagnose and monitor pediatric glaucomas, and it is well known that the central corneal thickness (CCT) can influence the measured IOP. However, in pediatric eyes with glaucoma, particularly glaucoma in eyes operated for congenital cataracts the role of CCT is not well defined. The aim of this study was to observe longitudinal changes in CCT and IOP following congenital cataract surgery in eyes with and without IOL implantation.

Methods: A Prospective, randomized observational study

comprising 80 consecutive eyes of 40 children undergoing bilateral congenital cataract surgery before their 2nd birthday and performed by a single surgeon were included. The study population was randomized into two groups. In Group 1 (n = 20 patients), 40 eyes were left aphakic and in Group 2 (n = 20 patients), 40 eyes were pseudophakic. A detailed examination under anesthesia (EUA) was performed for every patient, both preoperatively, and at each follow-up visit. Corneal thickness, intraocular pressure (IOP) axial length (AL) was measured. Standardized surgical procedures were carried out in both the groups. The patients were examined for CCT at 1 month, 1 and 2 years postoperatively. The percentage change in CCT at 1 month and 2 years was analyzed and compared with the preoperative findings.

Results: The mean preoperative CCT in Groups 1 and 2 was not significantly different [OD: Group 1 (538.13 µm) versus Group 2 (538.73 µm), p = 0.60; OS: Group 1 (537.23 µm) versus Group 2 (522.46 µm), p = 0.17]. At each follow-up visit, the postoperative CCT was statistically significantly different between the two groups [2 years follow-up: OD: Group 1 (627.00 µm) versus Group 2 (583.13 µm), p = 0.03; OS: Group 1 (627.23 µm) versus Group 2 (564.66 µm), p < 0.001]. Between the two groups, the absolute difference in percentage change in mean CCT from the preoperative period to 1 month and 2 years postoperatively was statistically significant. The mean IOP and AXL were not significantly different between OD and OS at any follow-up.

Conclusion: All the eyes showed an increase in CCT following the removal of congenital cataracts during the first two years of life. Eyes remaining aphakic showed a larger increase in CCT than those receiving a primary IOL after cataract removal. The rate of change in CCT was significantly lower in eyes with pseudophakia as compared to those with aphakia. The mean IOP was not significantly different between 2 groups at any follow-up.

P412 IRIDOCORNEAL ENDOTHELIAL SYNDROME. CLINICAL MANIFESTATIONS AND MANAGEMENT OUTCOMES AT A TERTIARY OPHTHALMIC CENTER

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Background: A hospital-based prospective observational case series review to document and describe clinical manifestations and management approaches to patients diagnosed with ICE syndrome presenting at the Glaucoma Department, Chittagong Eye Infirmary and Training Complex, Chittagong, Bangladesh.

Method: 25 patients who were diagnosed from November 2007 to October 2009 were included in the study. Patient particulars, history with main causes of hospital presentations were recorded. Ophthalmic examination details including tonometry, slit lamp examination, gonioscopy, indirect ophthalmoscopy, visual fluid examination and management given were documented. Similar relevant details were recorded for three follow up periods on all patients extending over a total period of 12 months.

Results: 25 patients were included in the study. There were 15 female and 10 male patients. All 25 cases were unilateral. The mean age of the patients was 41 ± 15.27 years. Among them 15(60%) had pretreatment visual acuity between 6/9 – 6/18 and 10 (40%) had 6/24 – 6/60. Improved visual acu-

ity was observed one year after starting treatment. 21 patients (84%) presented with eccentric pupil (corectopia), 9 patients (36%) with peripheral anterior synechiae, 6 patients (32%) with iris atrophy, 6 patients (24%) with mild corneal oedema, 3 patients (12%) with ectropion uveae, 2 patients (8%) with polycoria and 11 patients (44%) presented with pigmentary changes over iris (like diffuse iris naevus). Mean IOP at presentation was 24.08 ± 14.3 mmHg and that of last follow-up was 17.38 ± 7.57 mmHg. IOP was controlled with 2-3 topical anti-glaucoma medications in 8 patients (32%); with only observation in 5 patients (20%) and with surgical intervention in 12 patients (48%).

Conclusion: Although ICE syndrome is a refractory glaucoma, control of IOP and preservation of visual acuity were seen in 52% of cases which had conservative management with topical medications and observation. Patients not responding to medical management needed surgery for the control of intraocular pressure.

P413 ANGLE-CLOSURE GLAUCOMA IN YOUNG PATIENTS WITH GOLDMANN-FAVRE SYNDROME: REPORT OF TWO CASES

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Background: Goldmann -Favre Syndrome is a rare autosomal recessive retinal degeneration classically characterized by central and peripheral retinoschisis, and peripheral pigment deposition. On the other hand, angle closure is rare in young adults and is often associated with structural and/or developmental ocular anomalies rather than relative pupillary block.

Methods: Case reports of two young patients with Goldmann -Favre Syndrome who developed angle closure glaucoma.

Results: The two patients, 24 and 34 years old respectively, were sisters. The ophthalmologic, the optical coherence tomography, as well as the electrophysiologic findings were consistent with Goldmann -Favre Syndrome. Chronic primitive angle closure glaucoma with disk cupping was diagnosed in the four eyes. Ectopia, subluxation or forward movement of the lens, iridociliary cysts, other posterior segment causes of angle closure were ruled out. Glaucoma was controlled by peripheral iridotomy and medical treatment in one eye, and required trabeculectomy in three eyes.

Conclusion: Angle closure glaucoma may be associated with Goldmann -Favre Syndrome. To the best of our knowledge, this association has not been reported before. The pathophysiology remains not clear.

P414 ALGORITHMIC CHOICE OF SECONDARY GLAUCOMA TREATMENT METHOD IN CASES OF BLUNT EYE TRAUMA

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Background: Secondary glaucoma (hypertension) is an often earlier and later complication in cases of blunt trauma.

There are exists different glaucoma blocks such as trabecular, block of Schlemm's canal (bleeding, congestive trabeculopathy), angular, anterior chamber (total hyphema, lens luxation), pupillar (lens, vitreous body), and lens-ciliary body (phacomorphic) and even episcleral. Medicamental treatment (beta-adrenoblockers, carboanhydrase blockers, osmotic, haemoreologic, metabolic) often is not effective enough. Anterior chamber paracentesis with repeating 'burp' evacuation of blood and excessive intraocular liquid is effective, safe, cheap and quick procedure, especially in early period. Surgical treatment (Luxated lens removing, phacoemulsification, vitrectomy, anti-glaucoma surgery with or without drainage device implantation) performs due to indication according to elaborated algorithm. The severity of visual functional loss, its prognosis and dynamic change depends on premorbid state, traumatic factor specifications and peculiarities, amount of damaged eye structures and also on timely and adequate ophthalmic care, involved resources and recovery potential. So, in some cases with primary 'worse' state and prognosis there were much better functional outcome results and vice versa.

Methods: We investigated 54 patients (56 eyes) with secondary hypertension due to blunt and combined trauma (champagne cork (12 eyes), fist blow (24 eyes), wood or stone pieces (9 eyes), fireworks (6 eyes), car safety airbags (5 eyes, 2 patients – both eyes)). Earlier eye hypertension (1-3 hours – 1 day) appeared in 34 cases. Late eye hypertension (5-10 and more days) – 19 eyes. In most cases primary high levels of IOP were evaluated only approximately by palpation due to corneal or eyelids changes. Hyphema (39 cases), hemophthalm (22 cases), lens luxation (9 cases), and subluxation (12 cases), iris congestion, rupture and deformation (29 cases), retinal ruptures (9 eyes), edema (18 eyes) and detachment (6 eyes) diagnosis was confirmed by biomicroscopy, gonioscopy, ultrasound B-scan, anterior segment OCT, CT or MRT with video and/or photoregistration. Due to proposed algorithm of diagnostic-treatment tactic we achieved IOP decrease within 24 hours by means of medication in 29 eyes. In 18 cases we used anterior chamber paracentesis with repeating 'burp' procedure. In 14 cases early surgical treatment (luxated or subluxated lens removing – 4, phacoemulsification of subluxated lens (using ICR for capsular bag stabilization in 2 cases), traumatic congestive cataract – 2 cases, vitrectomy – 3 cases, anti-glaucoma surgery without drainage device implantation – 3 cases) was necessarily performed. Within following 3-6 month surgical treatment was performed due to eye hypertension in 8 cases of lens subluxation, and with extraocular implantation of glaucoma microdrainage device in 3 cases of refractory secondary glaucoma.

Results: All patients were followed up until steady improvement (1 month – 1 year). We got a distribution timeline of outcome of IOP levels. In cases with early hypertension without lens disposition we achieved IOP normalization within 7-10 days. Most often reason for late hypertension was repeated haemorrhage or lens / iris disposition. IOP normalization in these cases required more intensive medication treatment (combinations of pro- and anticoagulants, anti-oedematous, carboanhydrase inhibitors, osmotic agents, etc.). After 3 months from lens surgery operation IOP was below 20 mmHg without medication in 18 eyes and in 7 cases with medication. Most of patients (49 eyes) had substantial improvements in central vision and visual field. In cases with

posterior segment traumatic changes were performed vitreo-retinal interventions in specialized clinic.

Conclusion: In cases of blunt trauma secondary glaucoma (hypertension) may appear due to different pathogenesis mechanisms, so needs a differential diagnosis and different individual treatment approaches. In some cases hypertension was temporary and so it not been transformed into glaucoma – unexpressed or sub-threshold optic nerve changes. In other cases it became a major pathogenesis factor also in combination with direct traumatic damage of nerve fibers or supply mechanisms led to ‘true’ secondary glaucoma – optic neuropathy. So, though the value, significance and importance of symptomatic hypertension in cases of blunt eye trauma may vary, it still have to be in focus of ophthalmologists for seeking of individual complex approach.

P415 THE GENETIC FINDINGS AND THE TREATMENT RESULTS IN A PATIENT WITH A BILATERAL COMPLETE LENS LUXATION AND SEVERE GLAUCOMA

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Background: The association between ectopia lentis and phacogenic glaucoma is well described in the literature. This condition can be associated with a connective tissue disorder like Marfan and Weil Marchesani syndrome or be an isolated feature related with one of more than 600 mutation described in FBN1 gene. We report the genetic findings and treatment results in a patient with bilateral complete lens dislocation and chronic glaucoma in which we diagnosed a clinical Marfan syndrome of a new FBN1 gene mutation.

Methods: A 41-year-old Caucasian woman with medical history of arterial hypertension and family history of blindness and cardio vascular diseases was referred to our hospital for evaluation of the ocular hypertension which could not be controlled despite of maximum topical treatment with dorzolamide, timolol and travaprost. The complete ophthalmological examination including visual acuity, gonioscopy, axial length, refraction, slit light biomicroscopy and funduscopy was performed. The systemic anamnesis and examination according to the Ghent nosology was performed by a clinical geneticist in order to discard connective tissue or metabolic disorders

Results: The best corrected visual acuity was 0.2 OD and no light perception in OS and the intraocular pressure (IOP) was 33 OD and 56 OS (mmHg). The refraction was 90° -1.5 -1 DP OD and could not be examined in OS. The axial longititude was 31mm in OD and 30 mm in OS. The patient presented bilateral miosis, aphakia, myopic choroidopathy, cataract lenses luxated to the vitreous chamber and glaucomatous optic neuropathy of 0.8 disc / excavation ratio in OD and total atrophy in OS. She showed extensive anterior peripheral sinequia in both eyes. The further systemic evaluation showed tall body type with diminished superior/inferior body segment proportion and no augmented joints laxity. The genetic study disclosed heterozygote mutation consisting of c.504C>G (Cys168Trp) in FBN1 gene which according to ‘The Human Gene Mutation Database at the Institute of Medical Genetics in Cardiff’ has not been yet registered. Meeting 2 major (ectopia lentis and augmented axial longitud) and 1 minor (diminished superior/inferior body segment pro-

portion) clinical criteria the patient was diagnosed of Marfan syndrome and is now controlled by Clinical Genetics Department. Regarding to the ophthalmological management we performed pars plana vitrectomy, lensectomy and implantation of Ahmed glaucoma drainage device in pars plana in OD. Since the patient had no visual function in the OS we decided to perform trans-scleral cyclophotocoagulation with diode laser in order to treat the pain she referred. At this time the patient’s IOP is maintained lower then 20 mmHg in both eyes although she still requires the topical treatment with timolol and brimonidine. The corrected VA is of 0.5 OD and NLP OS and IOP.

Conclusions: In the presence of bilateral lens luxation, the exhaustive systemic and genetic evaluation is obligatory in order to discard a connective tissue systemic disease and its potentially lethal cardiac complications. Furthermore In our experience the systemic disorders and a new mutation in a FBN1 gene was associated with the sever phacogenic glaucoma.

P416 BILATERAL ANGLE CLOSURE WITH RAISED INTRAOCULAR PRESSURE FOLLOWING SNAKE BITE

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Introduction: Snakebite is a common medical emergency in India, causing multisystem involvement. Of the poisonous snakes commonly found in India such as saw scaled viper, Russell’s viper, common cobra and common krait, cobra venom is neurotoxic and viper venom is hemotoxic. Ocular complications with snake bite are rare. Ptosis, ophthalmoplegia, optic neuritis including uveitis have been described. But to our knowledge there has been no report of angle closure with raised intraocular pressure (IOP).

Methods/ Case description: This report describes three patients who developed bilateral angle closure after a snake bite. All the three patients were young and were started on anti-venom in our hospital. The anterior chamber was shallow OU and the IOP was in the late thirties. The second patient in addition had fibrous uveitis and the third patient developed choroidal detachment which were related to the use of anti-venom. One of the patients applied some form of native treatment over the eyes and as a result developed ocular pemphigoid like surface disorder.

Results: All patients were started on anti-glaucoma medications. Intensive lubricants were given and glass rod sweeping was performed in the patient with ocular surface problem. Laser iridotomy was performed OU in one of the patients. The IOP and anterior chamber depth returned to normal within a week of treatment.

Conclusion: The three cases emphasize the need for ocular examination in the systemic evaluation of a patient with snake bite especially when the patient is too sick to complain. The occurrence of vision threatening complications following snake bite that are reversible with timely treatment should be borne in mind.

P417 CASE REPORT: STURGE-WEBER SYNDROME WITH CHOROIDAL HAEMANGIOMA AND SECONDARY RAISED INTRAOCULAR PRESSURE

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Background: 13 year old girl, with Sturge Weber syndrome presented with complaints of blurring of vision of the right eye associated with intermittent headaches for 7 months. There was a large haemangioma on the right side of the face involving the frontal region extending to the right maxillary region. Vision was 6/36, with the presence of relative afferent papillary defect (RAPD). There was an episcleral haemangioma inferotemporally and choroidal haemangioma during fundus examination. Intraocular pressure in the right eye was 26mmHg compared to 16 mmHg in the left eye. Gonioscopy did not reveal any haemangiomas obstructing the angle of the anterior chamber. She was started on topical beta blockers to reduce her intraocular pressure which bought her time in maintaining optic nerve viability while waiting for the choroidal haemangioma to be treated.

Method: Case report.

Results: The intraocular pressure during subsequent follow up had reduced to 20mmHg. Patient no longer complained of headache and was planned for further management by the medical retina team following conformation of the choroidal haemangioma by MRI.

Conclusion: The large choroidal haemangioma had led to secondary raised intraocular pressure in this patient. There were no disruptions to the aqueous outflow at the angle, although uveoscleral outflow may have been compromised due to the large haemangioma. The intraocular pressure was controlled by reducing aqueous production using a topical beta blocker and enabled patient to be symptom free and to maintain her optic nerve viability while waiting for her haemangioma to be treated.

P418 THIRTEEN CASES OF CHORIORETINAL FOLDS ASSOCIATED WITH TILTED DISC SYNDROME

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Background: We experienced thirteen cases with both chorioretinal folds and optic disc dysplasia in the patients who were suspected glaucoma from fundus examination.

Material and Methods: Subjects were eighteen eyes of thirteen patients with both chorioretinal folds and optic disc dysplasia. The conventional glaucoma examinations including fundus photography and standard automated perimetry (SAP) with the Humphrey Field Analyzer II, optical coherence tomography (OCT) and ultrasonography (A and B-mode) were performed.

Results: All patients were female, with a mean age of 70.7 years, corrected visual acuity of 0.04 to 1.2, mean IOP of 14.7 mmHg, mean axial length of 24.95 mm, and mean MD of -7.84dB. The optic disc appeared hypoplastic and tilted in all eyes, and B-mode and OCT showed inferior staphyloma. Chorioretinal folds confirmed by OCT were observed in the upper temporal area, and orientated radially to the upper edge of the inferior staphyloma. Seventeen eyes showed visual field changes corresponding to inferior staphyloma, and eleven eyes revealed changes elsewhere in the visual field by SAP.

Conclusion: We experienced thirteen patients with chorioretinal folds which were possibly associated with morpho-

logical abnormality. The optic disc form and inferior staphyloma suggested tilted disc syndrome. Based on the chorioretinal folds radiating from the upper edge of the inferior staphyloma and the advanced age of all patients, we speculated that the inferior staphyloma became enlarged with aging, resulting in the traction of the thinned chorioretinal layer, leading to the development of chorioretinal folds.

P419 SINGLE SESSION PAN-RETINAL PHOTOCOAGULATION WITH PATTERNED SCAN LASER: IS GLAUCOMA A COMPLICATION?

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Background: Single-session pan-retinal photocoagulation (SSPRP) for proliferative diabetic retinopathy (PDR) with current 532nm Nd:YAG laser settings has been routinely discouraged in view of dreaded complications especially elevations of intra-ocular pressure, narrowing of anterior chamber angle and aggravation of optic neuropathy. Patterned SCAN Laser (PASCAL) offers decreased energy delivery to retinal tissue and thereby lesser complications. We sought to compare safety profile of SSPRP using PASCAL with multiple-session pan-retinal photocoagulation (MSPRP) conventional laser.

Methods: We conducted a prospective randomized controlled trial in which 31 eyes of 24 patients with PDR with high risk characteristics recommended PRP as per ETDRS criteria were administered SSPRP using PASCAL (n = 15) or MSPRP using conventional laser (n = 16). In our clinical trial comprising follow up at 6, 12 and 24 weeks, retreatment with conventional laser was provided in case of non-regression or aggravation of neovascularization at 12 weeks. Main outcome measures were intraocular pressure (IOP), anterior chamber depth (ACD) and gonioscopic assessment of anterior chamber angle. Laser parameters comprised fluence, pain using visual analogue scale and session duration. Following parameters were assessed before and after laser therapy: best corrected visual acuity (logMAR), +90D slit lamp bio-microscopy, indirect ophthalmoscopy, fundus fluorescein angiography (FFA), Optical Coherence Tomography (OCT), colour vision (using Nagel's anomaloscope), Humphrey visual field (HVF) SITA standard 30-2 analysis and micro-perimetry.

Results: Baseline IOP was 14.3 ± 1.8 mmHg for SSPRP group and 14.1 ± 1.5 mmHg in MSPRP group ($p = 0.813$). The IOP at 6, 12 and 24 weeks was 16.8 ± 1.5 , 17.2 ± 1.3 and 17.5 ± 1.4 mmHg in SSPRP group and 17.0 ± 1.6 , 17.9 ± 1.4 and 18.5 ± 1.1 mmHg in MSPRP group. Baseline ACD measurements were 2.7 ± 0.05 for SSPRP group and 2.72 ± 0.04 for MSPRP group ($p = 0.686$). The ACD at 6, 12 and 24 weeks was 2.64 ± 0.06 , 2.65 ± 0.05 and 2.62 ± 0.06 mm in SSPRP group and 2.64 ± 0.06 , 2.65 ± 0.05 and 2.62 ± 0.06 mm in MSPRP group. There was no significant difference in IOP ($p = 0.813$, 0.715 and 0.240 at 6, 12 and 24 weeks respectively) or ACD ($p = 0.644$, 0.529 and 0.477 at 6, 12 and 24 weeks respectively) during the follow up period between the two groups. Fluence, pain and session duration were found to be significantly lower for PASCAL ($p = 0.001$).

Conclusion: Single session panretinal photocoagulation with PASCAL does not lead to elevation of intra-ocular pressure or narrowing of the anterior chamber in the immediate post

laser period and at 24 weeks follow up as has been previously noted with single session conventional laser pan-retinal photocoagulation.

P420 HIGH RISK OF OPTIC-NERVE ATROPHY AND VISION LOSS DUE TO GLAUCOMA AMONG AFRICAN TYPE 2 DIABETICS

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Background: Systematic screening for diabetic ocular complications such as blindness and its major causes including glaucoma is not yet established in our setting. This study was undertaken to determine the prevalence of glaucoma in Black Africans with type 2 diabetes and to examine its association with low vision, cup-disc ratio > 0.6 and severe optic nerve atrophy.

Methods: A cross-sectional study of 150 type 2 diabetes was carried out.

Results: Of the 150, 57% of patients were female and 17.3% had glaucoma. 13% were blind. Blindness was due to Diabetic retinopathy (20%), glaucoma (19.2%), cataracts (18.3%) and optic nerve atrophy (7.3%). Of the patients with glaucoma, 50% had a cup to disc ratio of > 0.6, 34.6% had visual impairment and 50% had optic nerve atrophy. Only 11.5% of the 17.3% were known to have glaucoma prior to the screening. Diabetics with glaucoma had a higher risk of optic nerve atrophy (OR = 24.1, 95% CI 6.2-92.9; 44.4% vs. 3.3%; $p < 0.0001$) in comparison with those without glaucoma.

Conclusions: Glaucoma remains highly prevalent. It is the second most common cause of blindness. It confers a high risk of optic nerve atrophy in these African type 2 diabetics of whom almost 90% were unaware of glaucoma. Screening for early diagnosis and treatment of glaucoma are recommended for type 2 diabetes at primary care level.

P421 EFFICACY OF SURGICAL TREATMENT OF POST-INFLAMMATORY GLAUCOMA IN SIX-MONTH OBSERVATION

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Purpose: To evaluate the efficacy of surgical treatment in patients with secondary glaucoma due to uveitis.

Material and Methods: Retrospective analysis of the results of surgical treatment in cases of post-inflammatory glaucoma. Sixteen patients- 9 females and 7 males, aged 43-65 years (mean 55 years) were included to the study: 6 patients suffering from uveitis in arthritis, 3 patients with Posner-Schlossman syndrome and 7 patients with idiopathic non-specific uveitis. All patients underwent trabeculectomy with MMC performed in Department of Ophthalmology Medical University of Warsaw between January and June 2010 year. Pre-operative IOP during topical treatment with 3 or more anti-glaucoma drugs was on level of 22 mmHg.

Results: The IOP was low approx. 14 mmHg without topical treatment at the 3 month follow-up period. 6 months after surgery the same value of IOP (14 mmHg) without anti-glau-

coma drops, was obtained in 50% and with one drug in 50% cases. Complications such as cataract occurred in 30% cases, which were qualified to phacoemulsification procedure with pharmacologic anti-inflammatory protection. No recurrence of inflammation was observed during follow-up period.

Conclusions: Filtering surgery with use MMC is an effective method of lowering IOP in patients suffering from secondary post-inflammatory glaucoma.

P422 GLAUCOMA IN PATIENTS WITH AMYLOIDOTIC FAMILIAL POLYNEUROPATHY TYPE 1 AFTER LIVER TRANSPLANTATION

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Purpose: To evaluate the natural course of glaucoma among patients with amyloidotic familial polyneuropathy type 1 (PAF-1)

Settings: Serviço de Oftalmologia, Hospital de Santo António, Centro Hospitalar do Porto, Porto, Portugal

Methods: Retrospective, non-comparative study which included 98 patients with ocular manifestations of amyloidotic familial polyneuropathy type 1. Analysed data included: time since diagnosis of PAF-1, history of liver transplant, presence of ocular symptoms, ocular manifestations (namely, ocular surface disorders, iris and other anterior chamber structures anomalies, ocular hypertension, vitreous opacities and retinal / choroid alterations) and history of ocular surgery (namely vitrectomy for vitreous opacities and / or glaucoma surgery for uncontrolled ocular hypertension).

Results: All patients were submitted to a liver transplant. Minimum follow-up time was 12 months. The ocular symptoms presented were mostly related with ocular surface disorders (severe dry eye was the most common ocular manifestation found) and with vitreous opacities (the main cause of visual acuity loss found in this patients). Ocular hypertension was more frequent in patients with longer course of the disease and with iris and / or anterior chamber structures anomalies. Most patients required maximal medical therapy and a significant number needed one or more glaucoma surgeries to control the intraocular pressure. Glaucoma surgery outcomes were worse in this population, probably related to changes in trabecular meshwork and conjunctiva and with the continuous production of amyloid fibrils by the eye. The authors found also a positive correlation between vitrectomy for vitreous opacities and ocular hypertension worsening.

Conclusions: Liver transplant neither alters nor prevents the ocular manifestations of amyloidotic familial polyneuropathy. Ocular hypertension is a common complication of this disorder and frequently is of difficult control.

P423 CHANGES IN INTRAOCULAR PRESSURE AFTER PHACOEMULSIFICATION IN PATIENTS WITH BEHCET'S DISEASE

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Background: To investigate the changes in intraocular pressure (IOP) after phacoemulsification in uveitic eyes with cataract due to Behcet's disease.

Methods: In this study, thirty-five eyes of 29 patients with uveitis and cataract that had phacoemulsification with foldable intraocular lens implantation (IOL) implantation between 2004 and 2009 were analyzed. All uveitic eyes were in remission for at least 3 months before surgery. Any specific preoperative preparation protocol was not used. All surgery was performed using a standardized protocol: clear corneal incision, capsulorhexis, phacoemulsification, and in-the-bag monoblock foldable hydrophilic acrylic IOL implantation. Postoperative IOP's were evaluated in first week every day, in first month every week and then every month after surgery. The degree of postoperative inflammation was determined.

Results: The mean age of the patients was 41.34 ± 15.8 years (range 17 to 67 years). The mean postoperative follow-up was 31.9 ± 8.5 months (range 6 to 72 months). The mean IOP before surgery was 15.12 ± 3.9 mmHg, postoperative first day was 19.58 ± 4.3 mmHg, second day was 19.91 ± 4.9 mmHg, third day was 19.12 ± 3.3 mmHg, fourth day was 19.79 ± 4.1 mmHg, fifth day was 19.13 ± 4.4 mmHg, sixth day was 18.95 ± 3.1 mmHg, seventh day was 18.57 ± 3.9 mmHg, second week was 16.13 ± 2.8 mmHg, third week was 16.19 ± 3.1 mmHg, fourth week was 16.01 ± 2.9 mmHg, second month was 15.94 ± 2.5 mmHg, third month was 15.84 ± 2.0 mmHg, fourth month was 15.56 ± 2.4 mmHg, fifth month was 15.29 ± 2.7 mmHg, sixth month was 15.39 ± 2.4 mmHg. The mean IOP changes on postoperative first week in every day were significantly higher than the preoperative IOP's. But subsequent IOP changes were not significant than preoperative IOP's. IOP elevation was seen in patients with inflammatory attacks. Age, sex and axial length were not significantly related to IOP changes. Eleven eyes had mild one eye had severe fibrinous uveitis post-operatively.

Conclusions: With careful patient selection, diligent surgery and close post-operative supervision, phacoemulsification with in the bag intraocular lens implantation is safe and effective in patients with uveitic cataract. In this study, IOP elevation after phacoemulsification in uveitic eyes seems associated with inflammatory attacks.

P424 ARGON LASER PHOTOCOAGULATION IN TWO CASES OF NEOVASCULAR GLAUCOMA IN PATIENTS WITH AMYLOIDOTIC FAMILIAR POLYNEUROPATHY TYPE 1

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Purpose: To evaluate the results of treatment with Argon Laser Photocoagulation in two neovascular glaucoma patients with amyloidotic familiar polyneuropathy type 1 (PAF-1).

Methods: Retrospective study of two patients with neovascular glaucoma, not controlled with medical therapy alone, that performed panretinal argon laser photocoagulation after diagnostic of retinal ischemia with fluorescein angiography. The neovascular glaucoma is a rare but possible ocular manifestation of Amyloidotic Familiar Polyneuropathy Type 1. Analysed data included: time since diagnosis of PAF-1, history of liver transplant, presence of ocular symptoms, ocular manifestations, and the control of intraocular pressure (IOP) with the Laser Treatment.

Results: The IOP was controlled with the panretinal argon

laser photocoagulation and medical therapy, with no need for another type of glaucoma surgery. Minimum follow-up was 6 months. Both patients were submitted to liver transplant. Images data of retinal angiography before and after panphotocoagulation will be presented.

Conclusions: Liver transplant neither alters nor prevents the ocular manifestations of Amyloidotic Familiar Polyneuropathy. Glaucoma is a common complication of this disease, but neovascular Glaucoma is rare. In these cases, the authors achieved good IOP control with medical therapy and Argon Laser Photocoagulation.

P425 OBSTACLES AND SOLUTIONS OF GLAUCOMA CARE IN DEVELOPING COUNTRIES

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Glaucoma, the world's leading cause of irreversible blindness, was not included in the initial Vision 20/20 list. The main reasons include the inability to restore lost vision and the need for upgrading the substandard clinical skill levels of many developing country ophthalmologists. Additional barriers include some, or all, of the following: poverty: limited or absent follow-up visits because of transportation problems and/or patient indifference; limited medical treatment because drugs are unavailable, unaffordable or not taken; and the necessity of time consuming case-based rather than community-based screening.

Because insufficient past clinical education has resulted in present knowledge gap, the solution is that of upgrading the knowledge levels of all health care personnel (including primary care physicians and ophthalmology residents where indicated). In addition, the medical school curriculum should include training in an appropriate level of basic clinical ophthalmology.

An example of what can be accomplished by repeated 2-week glaucoma workshop visits will be discussed. The country is Nigeria: 140 million people, a higher prevalence of primary open angle glaucoma and less than 150 ophthalmologists who, with few exceptions reside in the cities. There are approximately 8 teaching centers scattered through out the country.

Over a period of 12 years the speaker has conducted eight 2-week glaucoma workshops and numerous presentations at national meetings resulting in a Nigerian Glaucoma Society and a glaucoma sub-specialty day preceding the annual meeting of the Ophthalmological Society of Nigeria. Repeat visits to Vietnam, Pakistan and Nepal have also resulted in a significant improvement in glaucoma care.

Although one-on-one teaching is ideal, it is not always possible. However, the Internet, which is now essentially available to all health-care personnel worldwide, contains free and an incredible variety of eye-care teaching material including gonioscopy tutorials, basic clinical ophthalmology teaching programs, individual study programs, videos of glaucoma surgery, CME possibilities and much more.

P426 MYOCILIN EXPRESSION IN UVEITIC, FUCHS HETEROCHROMIC IRIDOCYCLITIS AND NON-UVEITIC TRABECULAR MESHWORK AND AQUEOUS HUMOR

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Purpose: To compare the concentration of myocilin in aqueous humor (AH), and mRNA expression in trabecular meshwork (TM) in 3 groups of patients: Fuchs Heterochromic Cyclitis (FHC), other types of uveitic glaucoma (\pm steroid response), and primary open angle glaucoma (POAG).

Methods: Thirty-nine patients who were due to undergo trabeculectomy surgery at one institution were recruited, consented according to the Declaration of Helsinki, and divided into the following groups: A. 9 FHC, B. 16 Uveitic Glaucoma (without FHC) with or without significant steroid exposure, C. 14 POAG. A sample of AH was collected at the beginning of surgery. During the procedure a 2x1mm TM block was excised. AH samples were processed by SDS-PAGE and Western Blot (WB) analysis using anti-myocilin antibodies (Santa Cruz Biotechnology, 1:2000). For normalization of myocilin bands, blotted membranes were stained with Coomassie and digitized. The intensity of the albumin signal was determined using appropriate software and used to normalize the signal intensity of the myocilin band. RNA was isolated from TM samples, cDNA prepared and quantitative real time RT-PCR performed with primers specific for myocilin and GAPDH and GNB2L as housekeeping genes. Mean expression levels were compared using Student's t-test.

Results: There was no significant difference between groups B and C in WB analysis of the AH. Nevertheless, there was a trend towards higher values in group B. Interestingly, group A showed significantly higher values of myocilin in AH than those in group B ($p < 0.04$). When groups A and C were compared, this remained true ($p < 0.003$). Again, no significant differences were observed between groups B and C in RT-PCR of the TM samples. However, significant differences were found between groups A and B ($p < 0.05$), and A and C ($p < 0.05$).

Conclusions: We have not found specific evidence of a pathogenic role for myocilin in patients with non-FHC uveitic glaucoma, as expression levels are similar to POAG. We would speculate that the high levels of myocilin in AH of FHC patients are likely released from affected iris tissues, as the iris is often profoundly affected by FHC. The increased myocilin mRNA expression in TM specimens may indicate either a pathogenic process in the TM outflow pathways or a higher sensitivity to steroid treatment than is observed in other types of uveitic glaucoma or POAG.

Clinical Glaucoma: Other

P427 ISOLATED TRAUMATIC ANIRIDIA AFTER TRABECULECTOMY

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Background: The consequences of blunt trauma on an operated eye far differs from that on a virgin eye. Unoperated eyes usually rupture at the limbus or behind the insertions of the rectus muscles while the disruption of intraocular structures is limited in operated eyes. Aniridia as an isolated injury

has been described following phacoemulsification with foldable intraocular lens through a corneal or a scleral tunnel which is the standard of care for cataract. But that occurring with blunt trauma in an eye that had both trabeculectomy with antifibrotic agents for primary open angle glaucoma and phacoemulsification has not been reported. The effects of blunt trauma in our patient were reduced considerably due to the dissipation of the force of trauma through the trabeculectomy fistula and partly from the absorption of the forces by the flexible intraocular lens inside the eye.

Methods: This is a single case report of an elderly patient who had blunt trauma in an eye that had multiple surgeries. Details of mode of injury and surgeries done previously were noted. Slit lamp and fundus examination and intraocular pressure by applanation tonometer were performed.

Case description/Results: A 70 year old Chinese lady sustained blunt trauma to her right eye 4 months prior to her follow up visit to the glaucoma clinic. She had undergone trabeculectomies with 5FU in both eyes 10 years ago for primary open angle glaucoma. Three years later, she had undergone phacoemulsification with foldable IOL implantation through a 2.8 mm corneal tunnel in the right eye. On examination, the globe was intact but the whole of iris was missing. The capsular bag and zonules were intact and the intraocular lens was centred and stable and was visualised in their entire extent due to the absence of iris. The best corrected visual acuity was 6/9 in the injured right eye. The trabeculectomy bleb was low, diffuse, vascularised and there was no leak. The sclera underlying the bleb was pigmented and the pigmentation extended upto the fornix. A + 90 D examination of the disc revealed a cupping of 0.85 and the rest of the fundus and macula were normal. Gonioscopy revealed iris pigments at the fistula but no iris tissue fragments or areas of angle recession was noted. The intraocular pressure was 26 mmHg in the traumatised eye without medications.

Conclusion: Trabeculectomy and phacoemulsification in the right eye had limited the severity of blunt trauma to 360 degree iridodialysis.

P428 ABSTRACT WITHDRAWN

P429 CHANGES IN THE RETROBULBAR ARTERIC CIRCULATION AMONG MEN AND WOMEN AFTER DECREASE OF THE ELEVATED INTRAOCULAR PRESSURE IN PRIMARY OPEN-ANGLE GLAUCOMA

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Background: To evaluate changes of the hemodynamic parameters in the retrobulbar arteric circulation after decrease of the elevated intraocular pressure (IOP) in patients with primary open angle glaucoma (POAG).

Methods: 60 patients were examined, 33 men and 27 women, all up to 25 years old, all with diagnosed and treated

POAG, all examined at the Eye clinic Clinical Centre of Serbia. IOP was measured both with Goldmann Applanation (GAT) and Dynamic Contour tonometer (DCT). Imaging of the retrobulbar arterial circulation, with color doppler (CDI), was performed at the Neurology clinic Clinical Centre of Serbia, measuring hemodynamic parameters in the: Ophthalmic Artery (OA), Central Retinal Artery (CRA), and Posterior Ciliary Arteries (PCA). Peak systolic (PSV), end-diastolic (EDV) velocities were measured, and resistance (RI) and pulsatility indexes (PI) were calculated.

Results: Among women hemodynamic arterial parameter PSV increased in CRA, but decreased in OA and PCA; EDV increased in all three retrobulbar vascular levels; RI increased, but PI decreased in all three vessels. Among men, PSV, EDV and PI decreased in all three vessels; RI increased in OA, but decreased in CRA and PCA. Statistically significant change appeared in PI of the OA among women; and in EDV of the OA among the men.

Conclusion: In our study there was a difference between women and men in the retrobulbar arterial circulation after decrease of the elevated IOP in POAG. Changes in retrobulbar circulation are of importance for approach and treatment, but the role of vascular factors in the supplement of the optic disc neuroretinal rim, could be a key for progression backlash of glaucoma and the radix of neuroprotection.

P430 TEAR FILM OSMOLARITY IN PATIENTS TREATED FOR GLAUCOMA OR OCULAR HYPERTENSION

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Background: Chronic use of topical intraocular pressure (IOP)-lowering drugs and their preservatives is known to cause significant changes on the ocular surface. The purpose of the current study was to evaluate tear film osmolality in patients treated with intraocular pressure-lowering medications.

Methods: Forty patients treated for glaucoma or ocular hypertension (OHT) and followed at the Quinze-Vingts National Ophthalmology Hospital were consecutively recruited for the study. Each patient was asked to complete an evaluation of ocular surface disease (OSD) symptoms and underwent a complete evaluation of the ocular surface including tear film osmolality, Schirmer test, tear film breakup time (TBUT) and, corneal and conjunctival staining. Demographic information and glaucoma treatment were obtained from patient's medical records.

Results: Twenty eight patients (70%) had chronic glaucoma and 12 (30%) had OHT. There were 20 women and 20 men with a mean \pm SD age of 63.9 \pm 10.8 years. Twenty four patients (60%) reported OSD symptoms according to the OSDI. Nineteen patients (47.5%) had a tear osmolality \leq 308 mOsm/L, 11 (27.5%) between 309-328 mOsm/L and 10 (25%) > 328 mOsm/L. According to Schirmer test, a tear deficiency was observed in 20 patients (50%). Twenty seven patients (67.5%) had an abnormal tear quality analyzed with tear breakup time (TBUT) and 16 patients (40%) showed positive staining using the Oxford schema.

There was a statistically significant correlation between tear osmolality and the number of molecules ($r = 0.409$, $p = 0.009$), the number of instillations ($r = 0.405$, $p = 0.01$) and the number of instillations of preserved eyedrops ($r = 0.629$,

$p < 0.0001$). Using the multiple regression method, tear osmolality remained significantly correlated to the number of instillations of preserved eyedrops ($p = 0.004$). Tear osmolality was significantly correlated to OSDI ($r = 0.486$; $p = 0.002$) and TBUT ($r = -0.49$; $p = 0.009$).

Conclusion: Tear osmolality was increased in patients treated for glaucoma or OHT, particularly in those using multiple preserved eyedrops. The evaluation of the ocular surface of patients treated for glaucoma or OHT may benefit from such analysis and future trials for new intraocular pressure-lowering eyedrops should thus evaluate tear osmolality.

P431 CLINICAL CHARACTERISTICS OF GLAUCOMA IN PATIENTS UNDER FORTY YEARS OLD

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Background: Although clinical feature of glaucoma appeared in elder people has been studied thoroughly, that in younger people is behind in investigation. We herein examined the clinical characteristics of glaucoma in the Japanese young people whose ages were 40 years or younger.

Methods: The medical records of 265 cases with either glaucoma or ocular hypertension who visited our clinic of University of Occupational and Environmental Health Hospital more than twice from January 2003 to December 2007 were reviewed. We examined the type of glaucoma in all 265 cases, and then in patients with either developmental glaucoma (DG) or secondary glaucoma (SG) we studied clinical characteristics including a chief complaint at the first consultation, therapy and the prognosis of visual acuity. In this study, we defined DG as glaucoma that had goniodysgenesis with a glaucoma-related optic nerve change or ocular hypertension, normal tension glaucoma (NTG) as glaucoma having intraocular pressure (IOP) of 21mmHg or less with glaucoma-related optic nerve changes and the corresponding visual field disorders, and SG as glaucoma secondary to ocular or systemic disorders.

Results: Out of 265 cases, SG, DG, NTG, ocular hypertension, primary open angle glaucoma, primary angle closure glaucoma and others were 148 (55.9%), 45 (17.0%), 18 (6.8%), 17 (6.4%), 17 (6.4%), 3 (1.1%), and 17 cases (6.4%). Seventy-six eyes out of 198 (38.3%) 148 cases with SG showed corticosteroid associated IOP elevation. In the rest of eyes with SG, increase in IOP was caused by an ocular injury in 47 (23.7%), ocular inflammation in 41 (20.7%), an eye surgery in 25 (12.6%) and neovascular glaucoma in 2 eyes (1.0%). IOP elevation was transient in 155 eyes (78.3%) with SG, and the IOP has been controlled without any medications. Out of 62 eyes with DG, 10 eyes (16%) were early-onset DG, 36(58%) were late-onset DG, and 16(26%) were DG with other congenital anomalies. The eyes with early-onset DG showed poor prognosis with respect to the visual acuity, although those with late-onset had good one.

Conclusion: The clinical features of variable types of glaucoma in the Japanese younger people are quite different than those in the elder ones.

P432 EFFECT OF NSAID ON PROSTAGLANDIN-INDUCED IOP REDUCTION

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Purpose: The effect of NSAID on intraocular pressure (IOP) reduction by prostaglandin (PG) analogues has been reported but still controversial. This study aimed to investigate the effect of NSAID on IOP reduction by a short- and long-term concomitant use of travoprost in a double-masked randomized comparative study.

Methods: A short- (Study1) and a long-term (Study2) use of NSAID and PG analogues were conducted in normal subjects by a double-masked manner. Subjects of Study1 and Study2 were required to visit consecutive 2 days and 5 days in a month respectively for ophthalmic examinations under application of NSAID and travoprost 0.004%. In each visit, IOP was measured at 8:00, 14:00, and 20:00. IOP of day0 was measured for baseline and diurnal variation of IOP with NSAID and vehicle solution. In day0 and day1 of Study1 and day0, 1, 2, 7, and 28 of Study2, diclofenac and bromfenac Na was applied respectively 3 times a day to a randomly selected one of two eyes (NSAID eye), and vehicle solution was to the contralateral eye (control eye). From day1 of Study1 and 2, travoprost 0.004% was dropped into both eyes once daily at 8:00. IOP reduction at each measurement time was calculated in comparison with the IOP measured at the same time of day0 in consideration of diurnal variation of IOP.

Result: Study1. IOP reduction in control eye was 24.2 ± 7.5 , and $25.8 \pm 9.9\%$ at 6 and 12 hours after a single application of travoprost, respectively. IOP reduction in NSAID eye was 24.2 ± 9.3 , and $27.2 \pm 9.5\%$ at 6 and 12 hours, respectively. There was no significant difference between two groups after a single application of travoprost ($n = 30$). Study2. At day7 of control eye, IOP reduction from baseline at 8:00, 14:00 and 20:00 was 13.0 ± 14.4 , 13.3 ± 12.3 , and $18.8 \pm 10.5\%$, respectively. At day7 of NSAID eye, IOP reduction at 8:00, 14:00 and 20:00 was 15.3 ± 13.5 , 14.0 ± 11.9 , and $18.5 \pm 9.6\%$, respectively. At day28 of control eye, IOP reduction from baseline at 8:00, 14:00 and 20:00 was 17.2 ± 14.1 , 14.0 ± 12.9 , and $21.0 \pm 11.1\%$, respectively. At day28 of NSAID eye, IOP reduction at 8:00, 14:00 and 20:00 was 18.0 ± 14.1 , 15.2 ± 13.0 , and $21.8 \pm 9.8\%$, respectively. There was no significant difference between two groups ($n = 28$) in each IOP measurement time of 7 and 28 days after continuous application of travoprost, excepting at the morning of day7 ($p = 0.047$).

Conclusion: There was no significant effect of NSAID on IOP reduction by a short- and long-term application of PG analogues.

P433 RELATIONSHIP BETWEEN STRUCTURAL AND FUNCTIONAL DAMAGES IN EYES WITH OPEN-ANGLE GLAUCOMA AT AN EARLY STAGE

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Purpose: To investigate relationship between macular ganglion cell complex area (GCCA) and visual field defect in eyes with open-angle glaucoma (OAG) at an early stage.

Subjects and Methods: This study included seventy eyes of 70 OAG patients, who had a mean deviation better than -6.0 dB by the HFA C30-2 program. The morphological impairment was assessed by Cirrus spectral-domain optical coherence tomography. Based on the SD-OCT images measured perpendicularly through fovea using the 5-line raster mode, GCCA was calculated via a computerized software.

HFA test points were first separated into 5 areas: the innermost 4 points and 4 symmetrical areas divided by two oblique lines each 45° angled against the x-axis. The correlation between GCCA and the threshold in the sectorial visual field area was evaluated by a linear regression analysis.

Results: GCCA was calculated to be 11404.9 ± 1772.3 (arbitrary unit; range; 5599-15435). There was a statistically significant correlation between demonstrable smaller GCCA in either the superior or the inferior quadrant and the threshold in the innermost points ($p < 0.0001$, Spearman rank correlations). Additionally, the difference in GCCA between superior and inferior quadrants was significantly correlated with the difference in threshold between superior and inferior quadrants ($p = 0.0019$, Spearman rank correlations).

Conclusions: The central area showed structural and functional damages even at an early stage in OAG. Both damages are significantly correlated.

P434 CORRELATION BETWEEN STRUCTURAL AND FUNCTIONAL CHANGES IN GLAUCOMATOUS EYES

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Purpose: To determine the correlation between the morphological and functional changes in the macular region of eyes with open-angle glaucoma (OAG).

Methods: Twenty-eight eyes of 28 OAG patients were studied. The morphological parameters were obtained by optical coherence tomography (OCT), and the functional parameters were acquired by automated Humphrey Field Analyzer (HFA) and multifocal electroretinograms (mfERGs). All of the tests were performed in less than 6 months of each other. The retinal thickness was determined by OCT in nine sectors of the macula; the fovea, an inner ring and an outer ring with each divided into four quadrants. The amplitudes of the second order kernel of the mfERGs in the central 5 degrees including the amplitude ratio of the nasal to temporal hemispheres (N/T ratio) were analyzed. The total mean deviation of the HFA corresponding to each OCT region was measured and averaged. The correlations among the parameters were determined by coefficients of correlation and linear regression analysis.

Results: The N/T ratio was significantly correlated with the retinal thickness in the inferior quadrant ($r^2 = 0.264$; $p = 0.0138$). There was a significant correlation between the N/T ratio and the pattern standard deviation measured by the HFA central 10-2 program ($r^2 = 0.229$, $p = 0.0155$) and the nasal quadrant ($r^2 = 0.123$, $p = 0.0452$). The retinal thickness in each quadrant including the fovea was significantly correlated with the total deviation in the corresponding area ($p < 0.05$) except the inferior quadrant ($p > 0.05$).

Conclusion: Functional glaucomatous damage assessed by mfERGs and perimetry, and morphological retinal changes determined by OCT are significantly correlated.

P435 CORRELATION BETWEEN CENTRAL CORNEAL THICKNESS AND INTRAOCULAR PRESSURE MEASURED WITH GAT AND DCT IN GLAUCOMA PATIENTS OLDER THAN 60 YEARS

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Background: Previous studies proposed that central corneal thickness (CCT) is important for intraocular pressure (IOP) measurements with Goldmann applanation tonometer (GAT) and not for Pascal Dynamic Contour Tonometer (DCT). The aim of this study was to compare IOP results obtained with Goldman applanation tonometer (GAT) with results obtained with Pascal Dynamic Contour Tonometer (DCT) and to correlate them with central corneal thickness in patients with glaucoma older than 60 years.

Methods: Fifty eight patients (116 eyes) older than 60 years (age range 60–88), 24 male and 34 female were enrolled in this study. The patients were divided into six groups: healthy subjects (group I), normal-tension glaucoma patients (group II), ocular hypertension patients (group III), primary open angle glaucoma patients (group IV), primary closure angle glaucoma patients (group V), exfoliative glaucoma patients (group VI). The glaucoma diagnosis was made using the Heidelberg Retina Tomography II (HRT II) and Visual Field Test (Humphrey automated perimetry) and that patients were treated medically. Statistical analysis was done with commercially available SPSS program, Wilcoxon Signed Ranks Test and Pearson Correlation. Values of $p < 0.05$ were considered of statistical significance.

Results: Statistically significant difference between measurements of IOP with the GAT and DCT was determined in all groups: I group mean diff. 1.03 ± 0.98 mmHg, $p < 0.01$; II group mean diff. 1.12 ± 0.7 mmHg, $p < 0.01$; III group mean diff. 1.31 ± 1.56 mmHg, $p < 0.01$; IV group mean diff. 1.5 ± 1.57 mmHg, $p < 0.01$; V group mean diff. 1.46 ± 1.48 mmHg, $p < 0.01$; VI group mean diff. 0.79 ± 1.24 mmHg, $p < 0.01$. CCT was in direct correlation with the IOP values obtained both with GAT and DCT in the first and fifth group, while it was in the indirect correlation with these values in the other studied groups.

Conclusion: In our study CCT had no influence on IOP measurements both with DCT and GAT in none of the groups. DCT cannot replace GAT, but it is a reliable device for the measurement of IOP particularly in corneal deformations (keratoconus, after corneal refractive surgery, corneal scars, etc.).

P436 ANTERIOR MOVEMENT OF THE LAMINA CRIBROSA AFTER TRABECULECTOMY IN SPECTRAL-DOMAIN OPTICAL COHERENCE TOMOGRAPHY IMAGE SERIES T.-W. Kim¹, E.J. Lee², R.N. Weinreb³, K.H. Park⁴, S.H. Kim⁵, D.M. Kim⁴

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Background: The purpose of the study was to investigate the changes in the location of lamina cribrosa and the thickness of prelaminar neural tissue after glaucoma surgery using spectral domain optical coherence tomography (SD-OCT).

Methods: Optic discs of the 31 glaucoma patients who underwent trabeculectomy were scanned using enhanced depth imaging SD-OCT before surgery and 1 week, 1 month, 3 months, 6 months and 9 months postoperatively. The pre- and postoperative magnitude of the lamina cribrosa bowing and the thickness of the prelaminar tissue were determined on B scan images which contains the mostly depressed lamina cribrosa.

Results: Intraocular pressure (IOP) decreased from 28.1 ± 9.2 mmHg (range: 14 to 47 mmHg) to 10.0 ± 3.1 mmHg (range: 4 to 21 mmHg) over a mean follow-up of 4.7 ± 2.6 months. The amount of posterior bowing of the lamina cribrosa was significantly decreased from a mean preoperative level of 646.48 ± 171.10 μ m to 541.90 ± 141.17 μ m at the end of follow-up ($p < 0.001$). There was no significant change in the prelaminar neural tissue thickness (119.14 ± 50.46 μ m preoperatively, and 122.67 ± 50.43 μ m postoperatively, $p = 0.070$). The magnitude of the lamina cribrosa movement was significantly associated with greater percent IOP reduction ($p = 0.003$) and younger age ($p < 0.001$).

Conclusions: Using enhanced depth imaging SD-OCT of the optic nerve head, the anterior movement of lamina cribrosa following glaucoma surgery was demonstrated. No significant thickness change was observed in the prelaminar neural tissue thickness.

P437 CENTRAL CORNEAL THICKNESS IN DIFFERENT TYPES OF GLAUCOMA, OCULAR HYPERTENSION AND NORMALS

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To evaluate the central corneal thickness (CCT) in patients with primary open angle glaucoma (POAG), pseudoexfoliative glaucoma (PXFG), normal tension glaucoma (NTG), ocular hypertension (OH) and normal subjects.

Three hundred seventy two eyes (186 patients) were enrolled. Ninety were eyes with POAG, 36 with PXFG, 69 with NTG, 50 were suspects, 47 with OH and 80 eyes were normal. CCT was measured by means of ultrasound pachymetry with Tomey AL 2000. Correlation of mean CCT with age, gender, glaucoma stage and IOP was estimated.

The mean CCT of all eyes was 549 ± 36 μ m. The CCT of eyes with NTG was significantly less than that of the other groups ($p < 0.001$). Eyes with OH had significantly thicker corneas than all the other groups. Among patients with POAG, PXFG and NTG decreasing values of CCT were significantly related to older age. There was positive relation between CCT and IOP in normal eyes.

The results of this study suggest that differences in CCT exist in NTG and OH. Glaucoma patients with thin CCT are more likely to be found at a progressive stage of the disease and among those with NTG. There is a possible correlation among CCT and type and stage of glaucoma.

P438 CHANGES OF INTRAOCULAR PRESSURE AFTER PHACOEMULSIFICATION DONE IN EYES WITH PRIMARY OPEN ANGLE AND PRIMARY ANGLE CLOSURE GLAUCOMA

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Material and Methods: Retrospective analysis of changes in intraocular pressure in 84 patients with POAG and PCAG after uncomplicated cataract surgery; 57 with POAG, 27 with PCAG. Patients were treated with 2 or 3 anti-glaucomatous drops. The follow-up ranged from 6- 12 months.

Results: The mean VA before surgery was 0,4, the mean IOP was 17 mmHg. The mean number of glaucoma drops before cataract surgery was in POAG- 2,9, and in PCAG- 2,4. After 6 months follow-up the mean VA was 0,8, the mean IOP (with medications) was in POAG 18 mmHg, in PCAG 14 mmHg. The mean number of glaucoma drops 6 months after cataract surgery was in POAG- 3,1, in PCAG- 1,7. An increased IOP was noticed in 35% of cases in early postoperative period requiring oral and topical maximal hypotensive treatment. 12 patients (14%) were operated due to uncontrolled glaucoma within 6 months after cataract surgery.

Conclusions: Phacoemulsifications procedures performed in glaucomatous eyes treated with more than 2 kinds of drops imply higher risk of postoperative elevation of IOP levels. The number of anti-glaucomatous drops has decreased in most of patients with PCAG.

P439 OPERATION OF UPPER EYELID AS A RARE CASE OF INCREASED INTRAOCULAR PRESSURE

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Background: The authors present a rare case of unilateral elevated intraocular pressure after resection of major part of upper eyelid.

Methods: Retrospective review.

Results: The next day after the resection of basalioma of upper eyelid we found a large haematoma and swelling of upper eyelid, dilated episcleral vessels, edematous cornea, physiological anterior chamber and reaction of pupil, but blood in Schlemm's canal and high intraocular pressure (35 mmHg). We successfully used the combination of local anti-glaucoma drops in the treatment (timolol maleat 0,5% + dorzolamid 2%), but dilated episcleral vessels remained. Dilated episcleral vessels and blood in Schlemm's canal disappeared after reduction of swelling and haematoma of the upper eyelid. The intraocular pressure returned to normal even without medication.

Conclusion: The above described venous compression caused by swelling and shortening of the upper eyelid is an unusual case of elevated episcleral venous pressure and intraocular pressure. Elevated episcleral venous pressure is diagnosed by the clinical find of dilated episcleral vessels and blood in Schlemm's canal.

P440 VISUAL FIELD DEFECTS AND THE RISK OF MOTOR VEHICLE ACCIDENTS IN ADVANCED GLAUCOMA PATIENTS

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Background: The driving license in Japan requires 1) binocular visual acuity of 0.7 or more and 2) monocular visual acuity of 0.3 or more. If the subject has monocular vision of less than 0.3, a horizontal visual field of 150 degrees or more is required in the better eye. Therefore, even an advanced glaucoma patient can retain a driver's license if visual acuity

is good. The relationship between visual field loss and motor vehicle accidents (MVAs) has not yet been established. In this reports, we determined whether glaucomatous damage, assessed using binocular integrated visual field (IVF), correlates with MVAs.

Methods: Thirty-five advanced glaucoma patients with a mean deviation (MD) in both eyes less than -12 dB using the Humphrey field Analyzer 30-2 program (HFA30-2) underwent HFA30-2 and Esterman visual field testing. The binocular integrated visual field (IVF) was calculated by merging the results from the monocular HFA30-2. For IVF, we evaluated mean sensitivity within the superior and inferior hemifields. We also divided the central 10 degrees of the fixation point into six clusters (A, B, C, D, E, and F), and we evaluated the mean sensitivity for each cluster (Figure). We retrospectively studied the MVA history for the past five years, and we compared these visual field measures those who had had MVAs and those who had not had MVA.

Results: Of these 35 patients, 11(31%) of the driving glaucoma patients had had MVAs. Patients who had had MVAs exhibited lower MDs in the better ($p = 0.005$) and worse eyes ($p = 0.01$) than the patients who had not had MVAs but no significant differences with regard to the esterman points and scores. Retinal sensitivity for the superior clusters were relatively low in both groups, but IVF sensitivities in the lower hemifield within 5° and 10° of the fixation point significantly different ($p = 0.01$ and 0.03) between those who had had MVAs and those who had not had MVA.

Conclusions: IVF defects in the lower hemifield within 5° and 10° of the fixation point might be a predictive indicator of involvement in MVAs.

P441 VERY HIGH INTRAOCULAR PRESSURE (40 MMHG AND OVER) DISCOVERED AT ROUTINE EYE SCREENING: SHORT-TERM VISUAL OUTCOMES AND DIAGNOSES

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Background: There are concerns that high intraocular pressure (IOP) may cause sudden visual loss, for example due to retinal vein occlusion. When the IOP rises gradually patients are often asymptomatic or may have only minor symptoms. Thus, some patients may present with very high IOP during a routine optometrist's test, despite having few or no symptoms. In the UK, glaucoma screening is mainly performed by optometrists based in the community. The cases of high IOP are referred to the local hospital for further assessment by the ophthalmologist. National guidelines recommend that these cases should be referred within one week or sooner if IOP is over 45mmHg. After careful review of the published literature we could find no evidence to support the recommended timescale.

Aim: To determine short-term visual outcomes during the waiting period for an assessment of patients presenting to an optometrist with intra-ocular pressure measuring 40 mmHg or over, without 'acute glaucoma'.

Methods: Retrospective case note review. In clinic, patients were identified who had presented to an optometrist with an initial IOP of 40mmHg or more. Patients with any form of 'acute glaucoma' were excluded. Outcome measures: IOP at optometrist and at first ophthalmologist assessment, symp-

toms, time to assessment, diagnoses, visual loss while waiting for the ophthalmologist appointment, and central corneal thickness.

Results: 42 patients (51 eyes) have met our criteria, between 1998 and 2011. 29 patients (33 eyes) had IOP 40 mmHg or more at both the optometrist and the ophthalmologist. In 51 eyes IOP ranged 40-60 mmHg at optometrist, and 18-70 mmHg at ophthalmologist. Central corneal thickness averaged 554 μ m, SD \pm 33 μ m. The waiting period between the referral from optometrist and the assessment by ophthalmologist ranged between the same day and 84 days. At the optometrist 40% of patients were asymptomatic, 50% were complaining of gradual deterioration of vision and the rest had minor ocular symptoms (grittiness, glare, intermittent redness). In 51 eyes initial diagnosis at the ophthalmologist were: primary open angle glaucoma 43.1% (n = 22), combined mechanism glaucoma 15.6% (n = 8), ocular hypertension 17.6% (n = 9), pseudoexfoliation glaucoma 7.8% (n = 4), pigment dispersion glaucoma 5.8% (n = 3), neovascular glaucoma 1.9% (n = 1), Posner Schlossman syndrome 2% (n = 1), narrow drainage angle 2% (n = 1), glaucoma suspect 2% (n = 1), normal 2% (n = 1). There was no record of any patient losing any vision while waiting, e.g., from retinal vein occlusion.

Conclusion: The findings of the present study can be considered novel in determining short-term outcomes for patients who present with very high IOP. The present study does have some limitations: there are small numbers of patients and the data had been collected retrospectively. Based on our results we can conclude that these patients are not at high risk of sudden visual loss in the short term.

P442 REVERSAL GLAUCOMATOUS DISC CUPPING AFTER TRABECULECTOMY IN AN ADULT PREGNANT WOMAN

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Background: The objective of this work is to document a case of partial reversal of glaucomatous cupping in a pregnant adult patient after trabeculectomy. Additionally, to elucidate the frequency of presentation, possible causes and factors related to its appearance, its clinical behavior and the overall treatment of glaucoma in pregnancy, in the light of several articles on the subject have been published.

Method: The review of the patient's medical history and the search for some articles published about glaucoma, pregnancy and reversal of glaucomatous cupping. The type of this study is observational, descriptive case report type

Discussion: The regression of glaucomatous cupping rarely occurs in adults, being the key factor for its occurrence the decrease of intraocular pressure with medical or surgical treatment. It is hypothesized that it originates in the disappearance of the mechanical deformation, tissue changes, improve on fluids behavior or secondary to trabeculectomy. It is unclear when it occurs, its persistence over time or the associated visual function improvement. There are a lack of studies with sufficient numbers of patients and extended follow up. Additionally, The clinical course of glaucoma during pregnancy is variable, there are a lack of evidence-based protocols for its treatment, its approach is currently a challenge and the ophthalmologist should be consider individually

various elements like the maternal fetal risk – benefit, the behavior of intraocular pressure in the mother and the progression of glaucomatous damage.

Conclusions: A larger number of studies are required, with populations of a more representative size, and more observing time to solve the many mysteries surrounding the phenomenon of regression of glaucomatous cupping of the optic nerve, and its persistence over time the time of presentation after introduction of treatment (early or late), the dependence of their appearance with age or stage of glaucoma at the time of onset of therapeutic intervention or involvement in a tangible improvement at an apparent cellular functional anatomical improvement of the optic nerve. This also applies and as to the evolution and treatment of glaucoma in pregnancy.

P443 LONG-TERM MANAGEMENT AND OUTCOME OF SILICONE OIL INDUCED GLAUCOMA

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Background: Silicone oil is an important adjunct for internal tamponade in the treatment of complicated retinal detachment. One of important complications of its use is the development of secondary glaucoma. We investigated the management and outcome of silicone oil induced glaucoma.

Methods: Twenty-six eyes of 26 patients (averaged age 57.3 years old) with silicone oil induced glaucoma were investigated. Primary disease, intravitreal silicone oil duration, change of intraocular pressure (IOP), modality of treatment were reviewed retrospectively.

Results: Mean observation duration was 797.9 \pm 418.1 days. Twenty-two eyes of Rhegmatogenous retinal detachment (84.6%) and 4 eyes of proliferative diabetic retinopathy (15.4%) comprised the primary diseases of proliferative vitreous retinopathy (PVR). Mean IOP before initial surgery was 16.0 \pm 4.5 mmHg, and mean IOP at 3 \pm 1 weeks after silicon oil injection was 17.9 \pm 4.6 mmHg. Mean duration from the silicone oil injection to the time of IOP > 21 mmHg was 221.7 \pm 196.8 days. Silicone oil removal was performed in 14 eyes, and IOP was reduced in 10 eyes after silicone oil removal. High IOP persisted in 4 eyes after silicone oil removal and trabeculectomy was performed in these eyes. Mean intravitreal silicone oil duration was 550.5 \pm 328.4 days. Mean IOP after silicone oil removal was 22.3 \pm 11.5 mmHg, and mean IOP at final observation was 19.5 \pm 8.3 mmHg.

Conclusions: Secondary glaucoma induced by silicone oil injection is often difficult to manage and careful observation is needed for appropriate treatment.

P444 REPRODUCIBILITY AND ACCURACY OF TONO-PEN TONOMETER

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Purpose: To evaluate the reproducibility and accuracy of Tono-pen tonometer by repeated measurements intraocular pressure (IOP).

Methods: Eight -four patients (150 eyes) with cataract, retina detachment, or glaucoma and 2 healthy cases were enrolled in the study. Tonometry was performed on each patient using

Tono-pen tonometer and Goldmann applanation tonometer (GAT). Each tonometry was performed three times by two experimenters continuously. The patients were divided into three groups according to the their IOP readings: Group A with IOP < 11 mmHg, Group B with IOP between 11 and 21 mmHg, Group C with IOP > 21mmHg. The intra-observer and inter-observer reproducibility of the tonometry was analyzed. The accuracy of Tono-pen tonometer was compared with that of GAT.

Results: The intra-observer mean fluctuations measured by Tono-pen tonometer were 1.533 mmHg for Group A, 1.673 mmHg for Group B, and 3.474 mmHg for Group C. The mean measurement differences between the two experimenters were 1.59 mmHg for Group A, 1.50 mmHg for Group B, and 2.51 mmHg for Group C using Tono-pen tonometer. The measurement differences between Tono-pen tonometer and GAT ranged from -20.33 mmHg to 7mmHg, with absolute values ≤ 2 mmHg in 78 eyes (52.0%), ≤ 3 mmHg in 109 eyes (72.7%), and ≥ 7 mmHg in 9 eyes (6.0%). Compared with GAT, Tono-pen tonometer underestimated a mean reading of 0.86 mmHg for Group A and 5.76 mmHg for Group C. There was no significant measurement difference between the two tonometers for Group B ($p > 0.05$).

Conclusion: Tono-pen tonometer provides similar readings to those of GAT for individuals with normal IOP (11 – 21 mmHg) but lower than those of GAT for individuals with high (> 21 mmHg) or low IOP (< 11 mmHg).

Medical Treatment: General Management, Indication

P445 PREVALENCE OF OCULAR SURFACE DISEASE AND ITS IMPACT ON QUALITY OF LIFE IN GLAUCOMA PATIENTS

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Purpose: To examine signs and symptoms of ocular surface disease in treated glaucoma patients. To verify correlations between ocular surface disease and sex, age, number of bottles used and number of instillations pro die.

Methods: This prospective observational study enrolled consecutive topically treated open-angle glaucoma or ocular hypertension patients: patients presenting systemic or ocular conditions that could interfere with ocular surface status were excluded. Enrolled patients underwent a complete ophthalmic examination comprehensive of evaluation of tear break up time and fluorescein corneal staining (keratitis punctata evaluation) and completed the Italian version of both the NEI-VFQ 25 and the Glaucoma Symptom Scale questionnaires.

Results: 233 patients adhered to study protocol. Fluorescein corneal staining revealed punctatae keratitis in 90 (38.6%) patients, none had severe staining; abnormal TF-BUT was present in 61 (26,2%) patients. All these alterations were independent from age and sex. The presence of punctatae keratitis was significantly related to the number of used eye drop bottles ($p = 0.015$) and to the number of eyedrops pro

die ($p = 0.002$). Abnormal TF-BUT was independent from instilled eyedrops ($p = 0.95$). Both quality of life questionnaires pointed out a worsening trend in total means by increased grade of corneal staining (NS). The NEI ocular pain (OP) subscale was statistically related to number of instillations/die ($p = 0.020$).

Conclusions: Many patients present an ocular surface disease related to the number of instillations and eyedrops a day, and all these can affect their QL. The use of fixed combinations to reduce surface exposition and, better, of BAK-free formulations should be encouraged to try to reduce and contain the onset or worsening of this secondary condition in glaucoma patients.

Medical Treatment: Adrenergic Agonists and Antagonists

P446 BILATERAL GRANULOMATOUS UVEITIS ASSOCIATED WITH FIXED-COMBINATION OF BRIMONIDINE-TIMOLOL

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Background: Ocular allergic reactions are known to occur with chronic brimonidine therapy with a reported incidence of 4.2% to 15.7% of patients, depending on the dosing regimen and duration of therapy. Granulomatous uveitis is a rare adverse effect of brimonidine. Iritis has been mentioned as an adverse reaction in the postmarketing use of brimonidine. A reformulated solution of brimonidine preserved with chlorine dioxide rather than benzalkonium chloride (BAC) and at a reduced concentration of brimonidine (0.15%) was developed in an effort to improve tolerability. However, the fixed-combination of timolol-brimonidine contains brimonidine tartrate 0.2% with BAC 0.005%.

Methods: A 64-year-old man consulted with 12-month history of red eye, foreign body sensation, and photophobia in both eyes (Fig.1). He had a history of myopia, PRK and open-angle glaucoma. Phaco-trabeculectomy was performed on the left eye (OS) two years ago. He had been treated with fixed-combination of brimonidine 0.2%/timolol 0.5% twice daily in both eyes during the previous 16 months. His BCVA was 20/40 OD and 20/60 OS. Slit lamp examination revealed: severe conjunctival injection, papillary conjunctivitis, corneal punctate epithelial erosions, mutton fat keratic precipitates; 3+ cells and 2+ flare and iris nodules in both eyes (Fig. 2-3). The left eye showed a flat bleb and the vitreous was clear in both eyes. Fundus examination showed optic discs with C/D ratios of 0.6 OD and 0.8 OS. His intraocular pressure (IOP) was 12 mmHg OD and 5 mmHg OS. Central corneal thicknesses were 487 μ m and 490 μ m respectively.

Results: Glaucoma medications were ceased, prednisolone 1% every 4 hours and cyclopentolate 1% thrice daily was prescribed. Systemic evaluation comprising full blood count, urea, creatinine and electrolytes, liver function tests, serum angiotensin converting enzyme, ESR, CRP were all normal. Serology for syphilis, HLA-B27, rheumatoid factor, ANA, ANCA, and ENA were negative. Chest and spine x-ray were

unremarkable. Marked improvement was noted within 2 days. After 2 weeks both eyes were free of inflammation (Fig. 4-5). Topical steroids were tapered between 3 weeks. The IOP increased to 20 mmHg OD and 10 mmHg OS, timolol was added twice daily. Two month after completed resolution of uveitis, the patient agreed to perform a rechallenge with brimonidine in the right eye only. Three days later, he complained of photophobia and showed 1+ cells in the anterior chamber that resolved quickly on topical steroids. A diagnosis of drug-related bilateral anterior uveitis was confirmed.

Conclusion: Drug-induced uveitis has been reported with glaucoma medications, including metipranolol, prostaglandin analogs and miotics. Byles et al. proposed that continuing topical administration of brimonidine in eyes with allergic reactions may predispose to the development of uveitis. Patients with dark irides may have more susceptibility to develop uveitis because brimonidine had a higher concentration and cleared more slowly in pigmented tissues than in nonpigmented tissues.

In this case the elevation of IOP after treatment could be explained by cessation of glaucoma medications, side effect of steroids and resolution of hypotony secondary to uveitis. Chronic inflammation may have contributed to trabeculectomy failure.

P447 PHASE I STUDY WITH A SYL040012. A SIRNA FOR THE TREATMENT OF GLAUCOMA AND OCULAR HYPERTENSION

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Background: SYL040012 is a new topical treatment for ocular hypertension and open-angle glaucoma based on RNAi technology. Different doses of the compound were tested in healthy volunteers to evaluate the safety of SYL040012 and explore the effect on intraocular pressure (IOP).

Methods: SYL040012 is a new chemical entity targeting beta 2 adrenergic receptors (ADRB2) involved in intraocular pressure (IOP) regulation. SYL040012 siRNA targeting ADRB2 were administered as eye drops in saline solution to 30 healthy volunteers with normal IOP at two different doses (clinical trial Phase I).

The study was set out in two periods; the first period (n = 6 healthy volunteers) is an initial evaluation of safety using a single dose of product; the second period (n = 24 healthy volunteers) is in multiple ascending doses (a single daily administration in one of the eyes during 7 days). For both periods each volunteer was his own IOP control. The eye to receive administration was randomized. Safety evaluation and IOP measurement were performed on both eyes. The ophthalmologist evaluating safety was blind regarding drug administration. The second period began once security and pharmacokinetics of the first period were evaluated.

Results: Local tolerance was excellent. No modifications of the ocular surface or iris were detected. The analytical results at final examination did not show differences from those observed during selection. There were statistical differences between area under curve (AUC) of IOP curves on day four with respect to selection day curve (12% decrease) in all

volunteers administered with the low level dose of SYL040012 during seven days. Five of them (with an average basal value of IOP higher than the mean value for the whole group) showed reduction higher than 15%. SYL040012 was not detected in blood.

Conclusions: The Phase I clinical trial for SYL040012 was completed in 30 healthy volunteers. SYL040012 showed excellent local and systemic tolerance after single and multiple administrations to subjects.

P448 DIURNAL FLUCTUATIONS IN INTRAOCULAR PRESSURE (IOP) CONTROL WITH DIFFERENT FORMULATIONS OF TIMOLOL MALEATE 0.5%: A TWO-STAGE COMPARISON STUDY

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Background: Diurnal fluctuations in intraocular pressure (IOP) control in patients with primary open angle glaucoma (POAG) on treatment can further damage the optic nerve head, especially in cases of advanced glaucoma. Recently, OD dosing has been introduced for timolol maleate 0.5%; There are conflicting reports regarding its efficacy in maintaining a persistently low level of IOP in open angle glaucoma patients. We undertook a two stage study, first in normal human volunteers to determine the IOP lowering efficacy and duration of 1 drop of each formulation of timolol maleate and secondly in documented early POAG patients to determine whether the once daily formulations give uniform control throughout the 24 hour period.

Methods: Prospective randomized double blind clinical trial; Applanation tonometry, diurnal variation prior to therapy for dosage adjustment, punctual occlusion and K2 test for normality applied in both stages p < 0.01 considered significant. 1st stage: 60 volunteers randomly assigned to receive a SINGLE DROP of aqueous, semi-aqueous or gel formulations of timolol maleate in one eye (randomized), the other eye acting as a control, 3 groups, twenty in each group. IOP measurements with carried out at 2, 4, 8, 12 and 23 hours post instillation. Unpaired t test was carried out between test and control eye, and paired t test pre instillation and post instillation at each interval for the IOP recorded in the test eye. ANOVA test was used to analyse whether the difference in the IOP in the 3 groups at 23 hours post instillation was statistically significant. 2nd stage: Patients with bilateral early documented POAG (CD < 0.5) randomly assigned to receive timolol maleate (0.5%) semiaqueous (n = 28) or gel forming solution (n = 28) OD in both eyes. Pre instillation peak IOP recorded, therapy initiated and patients called for follow up on day 7 and day 15, two hours after morning dose at 2, 4, 8, 12, 16, 23 hours on day 7 and day 15. Paired t test used to compare differences in IOP at 2 hours with the IOP at 12 and 23 hours on day 7 & 15 in EACH group. Unpaired t test used on day 7 & 15 to compare the IOP at 23 hours post instillation between two groups.

Results: First Stage: Mean age-42.3 years (35-65 years). Duration of effect in all three groups: < 12 hours (p > 0.01 at 12 hours). No significant difference in IOP at 23 hours between 3 groups (p > 0.01). 2nd Stage: Mean age-47.2 years (40-57 years). IOP range- 22-27 mmHg pre treatment. Difference in IOP on day 7 between 2 and 23 hours post instillation was statistically significant in both groups (p < 0.01).

At day 15 the difference at same intervals was not significant. No significant difference between two groups at day 7 or 15.

Conclusion: Fluctuations in IOP occur in the first week of therapy with OD dosing of timolol maleate 0.5%. Twice daily dosing might be safer in the first week.

P449 EFFECT OF LONG-ACTING CARTEOLOL HYDROCHLORIDE 2% OPHTHALMIC SOLUTION ON 24-HOUR VARIATION OF INTRAOCULAR PRESSURE IN PRIMARY OPEN-ANGLE GLAUCOMA PATIENTS

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Background: We investigated the effectiveness of long-acting carteolol hydrochloride 2% ophthalmic solution on 24-hour variations in intraocular pressure (IOP) in primary open angle glaucoma (POAG) patients.

Methods: Fourteen POAG patients were treated with long-acting carteolol hydrochloride 2% ophthalmic solution for 6 weeks once daily at 8 o'clock in the morning, and their pre-treatment 24-hour IOP variations were compared with those measured after the treatment period. IOP was measured at 1, 4, 7, 10, 13, 16, 19, 22 o'clock.

Results: In the comparison of 24-hour variation of IOP before and after the treatment, IOP values were significantly reduced at 4, 7, 10 o'clock. The reduction of IOP was greater in the morning than in the afternoon or night-time. In the comparison of 24-hour mean IOP before and after the treatment, the mean IOP was reduced by 1.5 mmHg from 17.4 mmHg to 15.9 mmHg, and the percent reduction was 8.5% ($p < 0.0001$).

Conclusions: This study suggests that long-acting carteolol hydrochloride 2% ophthalmic solution lowers IOP especially in the morning, showing similar 24-hour variation of IOP by regular formulation of carteolol hydrochloride ophthalmic solution.

Medical Treatment: Prostaglandin Analogs

P450 COMPARISON OF HUMAN OCULAR DISTRIBUTION OF BIMATOPROST AND LATANOPROST

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Background: To investigate the ocular distribution of bimatoprost, latanoprost and their acid hydrolysis products in the aqueous humor, cornea, sclera, iris and ciliary body of patients treated with a single topical dose of bimatoprost 0.03% or latanoprost 0.005% for understanding concentration-activity relationships.

Methods: Thirty-one patients undergoing enucleation for an intraocular tumor not affecting the anterior part of the globe were randomized to treatment with bimatoprost or latanoprost at 1, 3, 6 or 12 h prior to surgery. Concentrations of bimatoprost, bimatoprost acid, latanoprost and latanoprost acid in the human aqueous and ocular tissues were measured using liquid chromatography tandem-mass spectrometry.

Results: Following topical administration, intact bimatoprost was distributed in human eyes with a rank order of cornea/sclera > iris/ciliary body > aqueous humor. Bimatoprost acid was also detected in these tissues, where its low levels in the cornea relative to that of latanoprost acid indicated that bimatoprost hydrolysis was limited. Latanoprost behaved as a prodrug that entered eyes predominantly via the corneal route. Levels of latanoprost acid were distributed as cornea > aqueous humor > sclera/iris > ciliary body.

Conclusions: The data suggest that bimatoprost reached the target tissues in humans favoring the conjunctival/scleral absorption route. Findings of intact bimatoprost in the ciliary body indicated its involvement in reducing intraocular pressure (IOP). Bimatoprost acid may have only a limited contribution on the basis that bimatoprost has greater/similar IOP lowering efficacy than latanoprost, yet bimatoprost acid levels were a fraction of latanoprost acid levels in the aqueous humor and cornea and only sporadically detectable in the ciliary body.

P451 THE EFFICACY AND SAFETY OF LATANOPROST, TAFLUPROST AND BIMATOPROST IN PATIENTS WITH GLAUCOMA OR OCULAR HYPERTENSION: A 3-MONTH COMPARATIVE CLINICAL TRIAL

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Background: Intraocular pressure (IOP) reduction is the primary goal for the treatment of patients with primary open-angle glaucoma (POAG), normal-tension glaucoma (NTG) or ocular hypertension (OHT). Many studies have suggested that IOP reduction might prevent the progression of optic nerve damage and visual field deterioration. There are currently 3 commercially available prostaglandin analogs for the primary treatment of glaucoma. The 0.005% latanoprost (LAT, Xalatan®, Pfizer, Inc., New York, NY) is a first prostaglandin analog that is a prototypical FP receptor agonist. The 0.0015% tafluprost (TFU, Tapros®, Santen Pharmaceutical Co. Ltd., Osaka, Japan) is a high affinity and selective FP receptor agonist with a universal design bottle. The 0.03% bimatoprost (BIM, Lumigan®, Allergan, Inc., Irvine, CA) is the first synthetic prostamide analog that lowers the IOP by interaction with the prostaglandin FP receptor and also the FP receptor variant (FP-altFP) complexes. To the best of our knowledge, no direct comparative study of LAT, TFU and BIM has been published. The purpose of this prospective study was to compare the efficacy and safety of LAT, TFU and BIM as monotherapy and as combination therapy with 0.5% Timolol (TIM, Timoptol®, Santen Pharmaceutical Co. Ltd., Osaka, Japan) in POAG, NTG or OHT patients.

Methods: A 3-month, prospective, open-label, clinical trial was designed. Sixty-nine patients with POAG, NTG or OHT were enrolled. After three baseline visits, the subjects received LAT treatment for a 3 month period starting from

December 2007. To take into account the IOP seasonal fluctuation, the TFU examination period began from December 2008, and the BIM examination period began from December 2009. Interview, slit-lamp biomicroscopy, IOP measurement, and funduscopy were performed at the baseline visits and at 1, 2 and 3 months after the starting examination period. The primary outcome measurements were the monthly IOP reduction rate (IOP-RR) and the rate of nonresponders (NR), defined as those with IOP-RR of 20% or less. Safety measures included adverse events, an objective assessment of conjunctival hyperemia, and corneal punctate keratitis. The impressions of treatment were assessed by questionnaires.

Results: Forty-nine patients completed the study. As monotherapy, BIM and TFU had significantly greater IOP-RR than LAT. As combination therapy with 0.5% Timolol, BIM had the strongest hypotensive effect. As monotherapy, the NR rate was 14.8% for BIM, 37.0% for LAT and 29.6% for TFU. The most frequent ocular adverse events were conjunctival hyperemia, reported in 44.4% of BIM patients, 29.6% of LAT patients and 25.9% of TFU patients. The degree of conjunctival hyperemia was greater in patients receiving BIM, however, it led to no discontinuations. The second most common ocular adverse event was corneal punctate keratitis, there were no significant differences among the three treatment groups. The patients preferred TFU for its convenience in the ophthalmic bottle and its good sensation of ophthalmic solution.

Conclusions: All treatments significantly reduced IOP and were well tolerated. BIM had the strongest hypotensive effect and its conjunctival hyperemia led to no discontinuation. TFU had a stronger hypotensive effect than LAT and superior tolerability.

P452 THE INCIDENCE OF DEEPENING OF UPPER EYELID SULCUS CAUSED BY TOPICAL TAFLUPROST OPHTHALMIC SOLUTION

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Background: Deepening of upper eyelid sulcus (DUES) has been recently reported as the new side effect caused by prostaglandin (PG)-related ophthalmic solutions, in addition to the conjunctival injection, elongation of eyelashes or pigmentation of eyelid. According to our previous investigation, about 40% patients had expressed DUES by 3 months after switching from latanoprost to bimatoprost. This time, we prospectively investigated the frequency and related risk factors of DUES in glaucoma patients newly started using one of PG analogues, tafluprost.

Methods: 26 glaucoma patients (13 males, 13 females) who were naïve to PG-related ophthalmic solutions were enrolled. After starting tafluprost eye drop in one eye, face photographs, IOP, and subjective impression of DUES were obtained at start point (0 month), after 2 month, 4 months, and 6 months. The presence of DUES was determined with the unanimous judgment of three examiners by the three photographs after starting medication displayed without chronological order. The relationship between the occurrence of DUES and age, gender, refraction, and IOP reduction were statistically analyzed.

Results: The incidence of DUES was 15% (4/26) at 2

months, 23% (6/26) at 4 months, and there was no increase in the incidence of DUES after 4 months. One patient noticed the subjective symptom of DUES by 2 months, but no one deactivated using this eye drop during this period. The incidence was significantly higher in non-myopic eyes ($p = 0.017$). There was no significant relationship between DUES and age, gender and IOP reduction.

Conclusion: About 20% patients expressed DUES by 4 months after newly started using tafluprost. When using PG analogues, we should concern about this side effect in addition to the others.

P453 EFFICACY AND SAFETY OF BIMATOPROST 0.03% IN JAPANESE NORMAL-TENSION GLAUCOMA

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Purpose: To evaluate the efficacy and safety of prostaglandin-related drugs, bimatoprost, in Japanese normal-tension glaucoma (NTG).

Participants: Thirty-eight NTG patients with IOP of 18 mmHg or less.

Methods: After approval of the study protocol by the Institutional Review Board, the study was conducted at six clinical centers. The inclusion criteria were as follows: apparent glaucomatous optic disc as well as visual field abnormalities in both eyes; IOP without glaucoma medication was 18 mmHg or less at least consecutive three times measurements; corrected visual acuity ≥ 0.5 ; spherical equivalent refraction ≥ -10.0 diopters. Qualified subjects were instructed to begin treatment with bimatoprost 0.03% ophthalmic solution at night in one eye, which was exhibiting higher IOP. For the cases with no apparent difference of baseline IOP was observed, the eyes with lower MD were enrolled for the present study. Time course of IOP and anterior segment findings (conjunctival hyperemia and superficial punctate keratopathy (SPK) were scored using each graded standard photograph) were examined at 2, 4, 8 and 12 weeks after treatment of bimatoprost.

Results: While 38 patients (age: 64.1 ± 12.6 ; 19 males and 19 females) were enrolled in this study, withdrawal from the study was observed in 6 patients because of presence of side effects or discontinuance of patient visit. The mean IOP of bimatoprost treated eyes was significantly reduced from 14.5 ± 2.3 mmHg at baseline to 10.9 ± 2.0 mmHg at 2 weeks ($p < 0.0001$), 10.8 ± 2.0 mmHg at 4 weeks ($p < 0.0001$), 10.9 ± 1.8 mmHg at 8 weeks ($p < 0.0001$) and 10.6 ± 1.7 mmHg at 12 weeks ($p < 0.0001$) in 32 patients which completed the study. The mean IOP of fellow eyes was not changed significantly through 12 weeks. The mean score of conjunctival hyperemia of treated eye increase significantly from 0.3 ± 0.4 at baseline to 0.7 ± 0.6 at 2 weeks ($p = 0.0065$), 0.8 ± 0.5 at 4 weeks ($p = 0.0001$), 0.9 ± 0.6 at 8 weeks ($p = 0.0001$), and 0.9 ± 0.4 at 12 weeks ($p < 0.0001$), and the mean score of SPK of treated eye was not changed from 0.07 ± 0.17 at baseline to 0.09 ± 0.19 at 2 weeks ($p = 0.8125$), 0.06 ± 0.13 at 4 weeks ($p = 0.7969$), 0.05 ± 0.11 at 8 weeks ($p = 0.8125$), 0.11 ± 0.18 at 12 weeks ($p = 0.3398$). Patients who experienced eyelash disorder, eyelid pigmentation and deepening

of upper eyelid sulcus were observed in 12 eyes, 5 eyes, 3 eyes, respectively.

Conclusions: While a small number of local side effects was observed, the present study suggests that bimatoprost has a potent IOP-lowering effect in Japanese NTG patients with IOP of 18 mmHg or less.

P454 EFFECT OF PROSTAGLANDIN ANALOGUES ON INHIBITION OF ADIPOCYTES DIFFERENTIATION AND ADIPOGENESIS IN 3T3-L1 CELL LINE

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Purpose: Prostaglandin analogues (PGs) are widely used for anti-glaucoma therapy. Recently, deepening of upper eyelid sulcus (DUES) are reported as cosmetic side effects in bimatoprost and travoprost, but not in latanoprost. However, the mechanism of DUES is unclear. We hypothesized orbital fat reduction is one of the causes of DUES, and planned to study the effect of PGs on adipogenesis in vitro.

Methods: 3T3-L1 preadipocytes were cultured and differentiated into adipocytes (day 0). At day 2, unoprostone (UNO), latanoprost acid (LAT-A), travoprost acid (TRA-A), tafluprost acid (TAF-A), bimatoprost (BIM), bimatoprost acid (BIM-A), and prostaglandin F2a (PGF2a) were added at the concentration of 100nM. At day 10, intracellular oil stained with Oil Red O were photographed by a microscopy to measure the area of oil. In one assay using all drugs, 50 areas were counted and 5 dependent experiments were repeated in a masked manner. The relative area of oil in the treated culture was calculated in comparison with that in the control culture with DMSO vehicle solution and analyzed by Dunnet test.

Results: The relative oil area of LAT-A, TRA-A, TAF-A, BIM, BIM-A, UNO and PGF2a were 38.7 ± 1.3 , 31.4 ± 13.4 , 59.6 ± 2.7 , 89.7 ± 3.1 , 28.3 ± 12.4 , 95.5 ± 2.3 , and $43.1 \pm 2.1\%$, respectively. All acid form of prost-type PGs, LAT-A, TRA-A, TAF-A, BIM-A, and PGF2a inhibited adipogenesis. TRA-A and BIM-A significantly inhibited adipogenesis ($p < 0.05$), but BIM and UNO did not. Prost-type PGs with high FP receptor affinity tended to show strong inhibitory effect compared to prostamide-type BIM and prostone-type UNO.

Conclusions: Although DUES were not clarified in all PGs, all acid forms of prost-type FP agonists were more potent than BIM and UNO in interfering adipogenesis in vitro. This result suggests that all prost-type PG analogues may have a potential to induce DUES, probably due to orbital fat reduction.

P455 INCIDENCE OF DEEPENING OF UPPER EYELID SULCUS AFTER TOPICAL USE OF TRAVOPROST IN JAPANESE

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Purpose: To investigate the incidence of deepening of upper eyelid sulcus (DUES) by topical use of travoprost in Japanese glaucoma patients.

Design: Prospective, observer-masked, open label, observational study.

Subjects and Methods: Thirty-one primary open-angle glaucoma patients (22 female and 9 male, 31 eyes) who had been treated with travoprost eye drops in unilateral eye were studied prospectively before and after prescription of travoprost for the fellow eye. The eyes and forehead were photographed and standard ocular examinations were performed before and 2, 4, and 6 months after use of travoprost in the (newly treated) fellow eye. The three post-treatment photographs were compared with the pretreatment photograph to determine if there was DUES. Three examiners assessed each patient independently in a blinded manner. The incidence of DUES and risk factors for DUES were analyzed.

Results: The prevalence of DUES was 35% (11/31), 52% (16/31) and 52% (16/31) at 2, 4 and 6 months, respectively, after use of travoprost was started. No new onset of DUES was found after 4 months of treatment. There were no differences in clinical factors between DUES-positive and -negative groups. Seven of 16 patients (44%) with DUES noticed subjectively changes of the upper eyelid sulcus, but no patient demanded to discontinue travoprost.

Conclusions: Careful examination of the patients revealed that DUES is a common adverse effect of travoprost instillation in Japanese glaucoma patients. Clinicians should pay attention to this complication.

P456 EFFECTS OF GLAUCOMA MEDICATIONS AND PRESERVATIVES ON HUMAN TRABECULAR MESHWORK AND NON-PIGMENTED CILIARY EPITHELIAL CELLS

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Background: We investigated the potential cytotoxicity of various topical prostaglandin analogs (PGA) formulations containing different preservatives in cultured human trabecular meshwork (TM) cells and non-pigmented ciliary epithelial (NPCE) cells.

Methods: We tested 0.004% travoprost preserved with either 0.015% benzalkonium chloride (BAK), sofZia®, or 0.001% polyquad® (PQ); and 0.005% latanoprost preserved with 0.020% BAK. Also tested was a range of BAK concentrations (0.001 – 0.020%) in balanced salt solution (BSS). TM cells were treated for 10 minutes at 37°C with solutions diluted 1:10 to mimic the reduced penetration of topical preparations to the anterior chamber. Viability was determined by assaying the uptake of the fluorescent vital dye calcein-AM and normalized to BSS controls.

Results: Exposure to increasing percentages of BAK decreased NPCE viability, although these small changes were statistically insignificant between the 0.0001% BAK (90% \pm 3%) and 0.0020% BAK (89% \pm 6%) exposure. In contrast, TM cells did show a significant decrease in cell viability when comparing 0.0015% BAK (67% \pm 8% live) and 0.0020% BAK (57% \pm 6% live, $p < 0.05$). At all concentrations of BAK tested, there were significantly more live NPCE cells than TM cells ($p < 0.05$). TM cells exposed to PGAs preserved with BAK had significantly higher number of live cells than their respective concentrations of BAK. In contrast, NPCE cells exposed to latanoprost + BAK, but not travoprost

+ BAK, performed significantly better than BAK alone (96% \pm 3% vs. 89% \pm 6% live NPCE cells; $p < 0.05$). In TM cells, exposure to travoprost + BAK had statistically fewer live cells (83 \pm 5%) than both travoprost + sofZia (97 \pm 5%) and travoprost + PQ (97 \pm 6%; $p < 0.05$). For NPCE cells exposed to the PGA travoprost, replacement of BAK with PQ or sofZia had no significant effect on cell survival.

Conclusions: In conclusion, our findings argue that replacement of BAK with alternative preservatives (PQ, sofZia) would potentially improve viability of TM cells, which are involved in maintaining the conventional outflow pathway in vivo. The cells responsible for aqueous inflow, NPCE, appear more resilient to BAK-induced damage.

P457 COMPARISON OF FOUR PROSTAGLANDIN ANALOGUES BY BILATERAL TREATMENT IN NORMAL SUBJECTS

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Background: To investigate the drug efficacy of 4 prostaglandin (PG) analogues by bilateral treatment in normal subjects, in three different study period. (latanoprost vs. travoprost, latanoprost vs. tafluprost, and latanoprost vs. bimatoprost).

Methods: This was a randomized, double-masked, clinical study. Twenty-four normal subjects were recruited in this study. As study 1, 'latanoprost vs. travoprost' was examined, and after taking a washout period of over 6 weeks, study 2, 'latanoprost vs. tafluprost', was performed. After a second washout period of over 6 weeks, study 3, 'latanoprost vs. bimatoprost', was done. In each study, 2 drugs were randomly assigned to one eye each. Study subjects instilled the assigned eye drops at 9:00 p.m. everyday for 2 weeks. The same masked investigator measured all intraocular pressure (IOP) using a Goldmann applanation tonometer. IOP measurements were done at 9:00 a.m., 1:00 p.m. and 5:00 p.m. at baseline (day 0), and were repeated on day 7 and 14. The differences in IOP reduction between drugs or subjects were statistically analyzed. Main outcome measurements are the mean diurnal IOP reduction, mean of IOP reduction at three time points, by PG analogues on day 7 and 14 from day 0.

Results: Average of the mean diurnal IOP reduction (mean \pm standard deviation, mmHg) on day 14 were latanoprost (3.4 \pm 1.4) vs. travoprost (3.5 \pm 1.3) in study 1, latanoprost (2.4 \pm 1.2) vs. tafluprost (2.6 \pm 1.3) in study 2, latanoprost (2.8 \pm 1.5) vs. bimatoprost (3.7 \pm 1.5) in study 3. The mean diurnal IOP reduction on day 14 by latanoprost was similar to that by travoprost and tafluprost, but was significantly smaller than that by bimatoprost. The strength of association of mean diurnal IOP reduction was moderate ($r^2 = 0.55 - 0.71$) between latanoprost and other 3 PG analogues on day 7. It was weak between latanoprost and bimatoprost on day 14 ($r^2 = 0.25$), which was in remarkable contrast to the strong association between latanoprost and travoprost or between latanoprost and tafluprost ($r^2 = 0.81, 0.82$, respectively).

Conclusions: The bilateral treatment protocol revealed a different IOP-lowering efficacy of bimatoprost compared to other PG analogues. Regarding the IOP-lowering mechanism

by bimatoprost, FP receptor plays critical role similarly to other PG analogues. However, recent study has shown that the prostamide itself, unhydrolyzed form of bimatoprost, had a distinct pharmacological activity through interaction with the putative prostamide receptor. It may be a reason of dissociated IOP response by bimatoprost compared to latanoprost on day 14. The results of this study indicate that it is reasonable to choose bimatoprost rather than travoprost and tafluprost when considering the switch of medication from latanoprost to other PG analogues.

P458 EFFICACY AND SAFETY OF TAFLUPROST IN NORMAL-TENSION GLAUCOMA WITH INTRAOCULAR PRESSURE OF 16 MMHG OR LESS

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Background: Normal-tension glaucoma (NTG) is the most frequently observed glaucoma type in Japan, and accounts for 72% of all glaucoma. Reduction of intraocular pressure (IOP) is the only evidence-based treatment method for glaucoma, and is also recommended for NTG. IOP reduction with the use of ophthalmic solutions as done in other types of glaucoma is also preferred for NTG treatment. Though prostaglandin (PG) analogues are recognized to be mostly effective in reduction of IOP among a variety of glaucoma ophthalmic solutions, efficacy and safety of PG analogues in NTG patients have not been fully investigated. Tafluprost ophthalmic solution (tafluprost), PG F₂ α derivative launched in 2008, appeared to have comparable IOP reduction effect and safety to latanoprost in primary open-angle glaucoma (POAG) and ocular hypertension. Tafluprost is reported to have significant IOP reduction effect even in NTG patients with IOP of 16mmHg or more. However, no study has investigated on NTG patients with IOP of 16 mmHg or less which accounts for 67.5% of NTG according to Tajimi study. In this study, therefore, we evaluated IOP reduction effect and safety of tafluprost in NTG patients with baseline IOP of 16mmHg or less.

Methods: NTG patients with baseline IOP of 16 mmHg or less in either eye were enrolled. The levels and the rate of IOP reduction were measured after tafluprost administration for 12 weeks. Presence of adverse drug reactions and the cumulative incidence rate of adverse events were also investigated.

Results: Forty-one out of 44 eyes of the 44 patients enrolled completed the study. As compared to the levels of baseline IOP (13.2 \pm 1.3 mmHg), significant ($p < 0.0001$) reduction of the levels as well as the rate of IOP was observed at Week 2 (2.5 \pm 1.3 mmHg, 19.3% \pm 10.2%), 4 (2.9 \pm 1.3 mmHg, 22.2% \pm 10.4%), 8 (2.8 \pm 1.2 mmHg, 21.4% \pm 9.0%) and 12 (3.0 \pm 1.4 mmHg, 22.7% \pm 10.5%) after tafluprost administration, respectively. No apparent adverse drug reactions were observed. The cumulative incidence rate of adverse events was 58.5%. Though ocular itching was most frequently observed (29.3%), all adverse events were clinically tolerable.

Conclusions: Tafluprost demonstrated a significant IOP

reduction in NTG patients with baseline IOP of 16 mmHg or less without apparent safety concerns.

P459 APPLANATION TONOMETRY VERSUS DYNAMIC CONTOUR TONOMETRY IN EYES TREATED WITH LATANOPROST

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Background: Previous studies have reported a general agreement between Goldmann Applanation Tonometry (GAT) and Dynamic Contour Tonometry (DCT), with the former providing slightly higher IOP readings than the latter. Nevertheless, an increased disparity in IOP readings between GAT and DCT has been reported for very high or very low central corneal thickness (CCT) scores. Prostaglandin analogues (PGA), such as latanoprost, cause a variety of ocular effects (such as a reduction in CCT), potentially affecting ocular bio-mechanical properties. This study aims at examining differences between GAT and DCT in eyes treated with latanoprost.

Methods: The Latanoprost Group (LG) included 41 eyes (of 24 patients) treated with latanoprost as the only anti-glaucomatous medication. The non-Latanoprost group, (NLG) included 19 eyes (of 11 patients) with glaucoma, receiving anti-glaucomatous medications other than prostaglandin analogues. The Control Group (CG) included 40 eyes of 20 non-glaucomatous patients. GAT, DCT, CCT and Axial Length (AL) measurements were performed. The difference between GAT and DCT intraocular pressure (dIOP) was calculated. Differences in dIOP between the 3 groups and correlations of dIOP with other clinical parameters were examined.

Results: dIOP was significantly higher in LG, compared with NLG or CG. The correlations of dIOP with AL was statistically significant in the LG but not in NLG or CG. Correlations of dIOP with CCT, patients' age and duration of latanoprost use (LG) were statistically not significant.

Conclusions: The fact that dIOP was significantly higher in LG, compared with NLG and CG implies that latanoprost may affect the bio-mechanical properties of the ocular walls. Taking into account the widespread use of latanoprost and other PGA in glaucoma treatment, their potential effects on the accuracy of IOP measurements imply that findings may affect clinical decision making for glaucomatous patients.

P460 EFFECT OF LATANOPROST ON CENTRAL CORNEAL THICKNESS IN UNILATERAL NORMAL-TENSION GLAUCOMA

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Background: To evaluate the effects of latanoprost on central corneal thickness (CCT) in patients with unilateral normal tension glaucoma(NTG).

Methods: Thirty-two eyes of 32 patients with unilateral NTG who were being followed in our hospital's glaucoma clinic and were receiving latanoprost monotherapy were recruited for the study. The data were collected retrospectively from the patients, who were medicated with latanoprost, at the initial diagnosis of glaucoma. Mean CCT and the CCT reduc-

tion from baseline were assessed at initial diagnosis, 3 and 6 months after the initiation of the treatment. An unaffected eye without any ocular medication was also evaluated. All the measurements were performed with a commercially available pachymeter.

Results: Mean age was 54.37 ± 18.43 years old. There were no significant differences between the eyes for baseline IOP and CCT. Mean CCT and CCT changes in the latanoprost-treated eyes (affected eye) and contralateral eyes (unaffected eye) were significantly different at every follow-up ($p < 0.05$ in each case): Latanoprost-treated eye ($n = 32$): 529.1 ± 29.6 vs. 524.2 ± 26.6 ($p < 0.000$) vs. 522.5 ± 32.2 μm ($p < 0.000$); contralateral eye ($n = 32$): 530.5 ± 28.3 vs. 530.9 ± 30.6 ($p = 0.684$) vs. 530.4 ± 28.0 μm ($p = 0.688$)

Conclusion: Topical therapy with Latanoprost is associated with CCT reduction over a period of 6 months in patients with unilateral normal tension glaucoma.

P461 LONG-TERM EFFECT AND SAFETY OF LATANOPROST MONO-THERAPY ON PRIMARY ANGLE-CLOSURE EYES AFTER LASER IRIDOTOMY

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Background: We investigated prospectively the long term effect and safety of latanoprost on primary angle closure (PAC) and primary angle closure glaucoma (PACG) after laser iridotomy (LI).

Subjects and Methods: Subjects included were PAC/PACG patients over 40 years of age, 18mmHg or higher intraocular pressure (IOP), previous laser iridotomy for longer than 3 months. Right eyes were analyzed in most of cases. Two left eyes were used because of past intraocular surgery. Total of 16 eyes of PAC and 4 eyes of PACG were investigated. IOPs and adverse events were measured and monitored at before and 1, 3, 6, 9, 12 months after initiating evening dose of latanoprost. Humphrey visual field were checked at before and 6, 12 months of instillation of latanoprost.

Results: Base line IOP before treatment was 21.8 ± 2.2 mmHg. Significant IOP reduction was observed at every time points. % reduction of IOP at 12 months was -5.6~35.6% and MD value was unchanged at 12months after treatment. Eye lid pigmentation in 4 cases(20%), conjunctival hyperemia in 3 cases(15%), mild keratitis in 2 cases(10%), and trichiasis(1 case), itching(1 case) were observed, respectively. All adverse events were minimum to mild and none stopped treatment.

Conclusion: Latanoprost mono-therapy effectively and safely lowered IOP for PAC/PACG patients for long time period up to 12 months.

P462 IOP-LOWERING EFFECT OF TAFLUPROST IN NORMAL TENSION GLAUCOMA: A PROSPECTIVE OBSERVATIONAL POST-MARKETING STUDY IN JAPAN

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Background: Tafluprost, a newly developed prostaglandin (PG) analogue, was introduced in Japan in December 2008. In order to evaluate the efficacy and safety of tafluprost in

everyday clinical practice, a mandatory post-marketing study is currently being conducted. As shown in epidemiologic studies, most Japanese glaucoma patients have normal tension glaucoma (NTG), and therefore we conducted a subgroup interim analysis focusing on the intraocular pressure (IOP) lowering effect of tafluprost in patients with NTG.

Methods: This is a prospective, multi-center, observational, 2-year follow-up study. Data collection points are at 2, 12, and 24 months after the beginning of the tafluprost therapy. A total of 3038 patients were registered between December 2008 and August 2010 from 422 sites, of which 1256 were NTG patients.

Results: The mean age was 65.9 ± 12.7 years. At baseline, mean IOP was 15.3 ± 2.8 mmHg and 53% of patients had IOP levels of 15 mmHg or less. As for treatment patterns, 787 patients (63%) were received tafluprost as their first medicine and 377 patients (30%) were switched from other drugs, mainly other PGs. In the newly-treated group, the mean IOP was significantly reduced, in both the 'low-teen' (≤ 15 mmHg) and the 'high-teen' (> 15 mmHg) groups, from 13.4 ± 1.6 mmHg at baseline to 11.5 ± 2.1 mmHg after 2 months of tafluprost ($p < 0.001$) and from 17.8 ± 1.5 mmHg to 13.9 ± 2.3 mmHg ($p < 0.001$), respectively, and the percentage of IOP-decrease was 13.7% in the low-teen group and 22.0% in the high-teen group. In the switched-drug group, the mean IOP prior to switching to tafluprost, 14.6 ± 2.7 mmHg, significantly decreased to 13.0 ± 2.6 mmHg at 2 months ($p < 0.001$).

Conclusion: Tafluprost is effective in NTG patients, both as the first treatment and after switching from another medication.

P463 IMPROVED LOCAL TOLERABILITY AND EFFICACY AFTER SWITCHING TO PRESERVATIVE-FREE TAFLUPROST IN PATIENTS WITH REDUCED TOLERABILITY TO LATANOPROST EYE DROPS

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Background: The aim of the study was to investigate whether patients with reduced/poor local tolerability to Xalatan (latanoprost with benzalkonium chloride) benefit from switching to preservative-free Taflotan (tafluprost).

Methods: Open-label, multicenter study including a total of 185 patients with open angle glaucoma or ocular hypertension at 7 centers. To fulfill the inclusion criteria the patients had to exhibit at least 2 symptoms (irritation/burning/stinging, foreign body sensation, tearing, itching or dry eye sensation), or one symptom and one sign (fBUT < 10 sec, significant corneal and conjunctival fluorescein staining, blepharitis,

conjunctival hyperemia or poor tear secretion (≤ 10 mm in Schirmer's test)). The patients were switched from Xalatan q.d. treatment to preservative-free Taflotan q.d. treatment for a 12 week period. Xalatan was provided in eye drops bottles whereas preservative-free Taflotan was provided in unit dose pipettes, which necessitated an open-label study design. Primary outcome measures were ocular symptoms and signs at weeks 6 and 12 of preservative-free Taflotan treatment compared to Xalatan treatment at baseline. Intraocular pressure (IOP), drop discomfort, quality of life (COMTOL) as well as safety were also assessed in all patients.

Results: There was a dramatic and statistically highly significant reduction in the number of patients exhibiting ocular symptoms of reduced/poor local tolerability after switching from Xalatan to preservative-free Taflotan both at 6 weeks and 12 weeks of treatment. The same was true for ocular signs. The tear film break-up time (Mean \pm SEM) increased from 6.4 ± 0.4 sec during Xalatan treatment to 9.5 ± 0.4 sec at week 12 of preservative-free Taflotan treatment ($p < 0.001$), and the mean conjunctival hyperemia on a scale from 0-4 was reduced from 1.63 ± 0.06 on Xalatan treatment to 0.65 ± 0.05 at week 12 on preservative-free Taflotan treatment ($p < 0.001$). There was also a marked reduction in the number of patients with drop discomfort and an increase in the number of patients with better quality of life. IOP (Mean \pm SEM) was reduced from 16.5 ± 0.2 mmHg during Xalatan treatment at baseline to 15.0 ± 0.2 mmHg at week 12 of the preservative-free Taflotan treatment. Throughout the treatment period IOP was lower during the preservative-free Taflotan treatment compared to Xalatan at baseline ($p < 0.001$; RM ANCOVA). In 20 patients treatment related adverse events were reported, but only 9 patients were withdrawn due to adverse events. Overall preservative-free Taflotan was well tolerated.

Conclusions: Patients with symptoms/signs of reduced/poor local tolerability to Xalatan significantly benefited from switching to preservative-free Taflotan. Thus it is likely that the high concentration of BAC in Xalatan reduces the local tolerability of the drug. In such patients preservative-free Taflotan appears to be a good alternative to avoid local side effects. In addition, after switching from Xalatan to preservative-free Taflotan IOP was further reduced.

P464 EFFECTS OF BENZALKONIUM CHLORIDE- OR POLYQUAD®-PRESERVED COMBINATION GLAUCOMA MEDICATIONS ON HUMAN TRABECULAR MESHWORK CELLS

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Background: We investigated the potential short and long-term effects in cultured human trabecular meshwork (TM) cells of various topical combination anti-hypotensive formulations containing different preservatives.

Methods: We tested the combination medication of 0.004% travoprost plus 0.5% timolol preserved with either 0.015% benzalkonium chloride (BAK), or with 0.001% polyquad® (PQ); and 0.005% latanoprost plus 0.5% timolol preserved with 0.020% BAK. Also tested was a range of BAK concentrations (0.001 – 0.020%) in balanced salt solution (BSS). Cells were treated for 25 minutes at 37°C with solutions diluted 1:10 to mimic the reduced penetration of topical preparations

to the anterior chamber. The percentage of live cells was determined immediately after treatment through the uptake of the fluorescent vital dye calcein-AM and normalized to BSS controls. To determine any long-term effects, we assayed apoptosis and release of matrix metalloproteinase 9 (MMP-9) 24 hours after exposure to solutions diluted 1:100.

Results: BAK solutions demonstrated a dose-dependent reduction in TM cell viability when assayed immediately after exposure. We observed statistically significant decreases in TM cell viability ($p < 0.05$) as BAK was increased from 0.0005% ($79 \pm 7\%$ live) to 0.0020% ($33 \pm 3\%$ live). In 1:10 dilutions, latanoprost plus timolol preserved with BAK ($29 \pm 9\%$ live cells) was similar to its corresponding BAK concentration ($33 \pm 3\%$). However, diluted travoprost plus timolol preserved in BAK had significantly more live cells ($83 \pm 12\%$) than the corresponding amount of BAK ($49 \pm 10\%$). Travoprost plus timolol preserved with BAK had statistically fewer live TM cells ($79 \pm 7\%$) than the same preparation preserved with PQ ($93 \pm 1\%$; $p < 0.001$). When assayed 24 hours after BAK treatments, we found an inverse relationship of BAK concentration to the number of apoptotic TM cells, with $45\% \pm 8\%$ apoptotic cells after 0.00001% BAK exposure compared to $6\% \pm 4\%$ apoptotic cells after 0.00020% BAK exposure. We also found that 0.00020% BAK exposure resulted in elevated levels of extracellular MMP-9 at 24 hours.

Conclusions: BAK is toxic to TM cells at concentrations $1/10^{\text{th}}$ of that found in topical combination therapies. Travoprost plus timolol with BAK, but not latanoprost plus timolol with BAK, countered some of the toxic BAK effects. Travoprost plus timolol with PQ had more live TM cells than either travoprost plus timolol with BAK or latanoprost plus timolol with BAK. BAK treatment showed elevated levels of MMP-9, a matrix metalloproteinase implicated in the pathogenesis of glaucoma. Assays of apoptosis in TM cells suggest that low concentrations of BAK, which show no reduction in cell viability in the short term, may nevertheless trigger apoptosis in the long term. These results demonstrate that the substitution or removal of the preservative BAK from topical ophthalmic drugs results in greater viability of TM cells.

P465 PIGMENTARY GLAUCOMA. CASE REPORT

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Background: A healthy man in age of 20, dedicated to sport activities, complaining of sudden blur on his left eye during skiing. Symptoms were less in the morning and worsening during the day. He has myopia of -4.0Dsph, wears contact lenses and best corrected visual acuity on both eyes is 0.9. The patient's grand mother is blind on one eye due to glaucoma.

Methods: A patient came to glaucoma department of Clinical center of Vojvodina (Serbia) on January 2011. The IOP was measured with Goldman applanation (OD = 24 mmHg, OS = 38 mmHg). A Gonioscopy showed the open angle-grade 3 (Shaffer scale) with excessive pigmentation-grade 3 of his right eye and grade 4 of his left eye. The 90D indirect ophthalmoscopy of patient's right eye showed C/D = 0.5/0.5 and even larger C/D = 0.9/0.9 of his left eye. The additional diagnostic was performed with Humphrey® automated visual field analyzer using Threshold C30-2 and SITA-standrad algorithm. The OCT exam of optic nerve head and retinal nerve fibre layer was done on Carl Zeiss Cirrus HD instrument.

Results: A mild visual field damage on the patients right eye showed MD value of -1.4 dB and the advanced damage was found on his left eye with MD value of -14 dB. The OCT confirmed glaucoma damage of patient's left eye comparing to the right eye, which parameters were in the normal range. The average retinal nerve fiber layer (RNFL) thickness of right eye was 109 μm and RNFL thickness of the left eye was 62 μm . A RNFL symmetry was 64%. A cup volume of the right eye was 0.404 mm^3 and the left eye cup volume was 1.306 mm^3 . The average C/D ratio value measured on OCT was 0.63 for the right eye and 0.86 on the left eye.

Conclusion: There was some of the pigment on corneal endothelium on the slit lamp examination although retroillumination iris defect was not visible. A therapy started with prostaglandin F2a analogue (Xalatan®, Pfizer). In only 3 days the IOP reduced significantly, with value of 15 mmHg for the right eye and 16 mmHg for the left eye. Comparing to baseline values IOP decrease was 37% on the right eye and 58% on the left eye.

P466 THE LONG-TERM EFFECTS OF TRAVOPROST ON THE BIOMECHANICAL PROPERTIES OF THE CORNEA

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Background: Travoprost has effects on extracellular matrix and collagen metabolism in the ciliary body. The same mechanisms probably act in cornea. The aim of the current study was to analyze the effects of Travoprost on the corneal biomechanical parameters measured with Ocular Response Analyzer (ORA).

Patients and Methods: Forty-seven eyes of 47 patients with newly diagnosed primary open angle glaucoma. normotensive glaucoma or ocular hypertension were included. Patients were examined before treatment and at the first and sixth months after the onset. Patients who had corneal abnormalities and history of previous ocular surgery or topical medication were excluded. Metrics of corneal biomechanical properties, including corneal hysteresis (CH) and corneal resistance factor (CRF), were measured with the ORA. The ORA also determined the values of intraocular pressure (IOPg) and corneal compensated IOP (IOPcc).

Results: Twenty-eight males and 19 females with a mean age of 57.0 ± 8.9 (41-77) years were included in the study. The mean visual acuity was 0.86 ± 0.26 (Snellen) and the mean CCT measured by ultrasonographic pachimetry was $570.7 \pm 49.8 \mu$. The mean IOP measured by Goldmann applanation tonometry which was 25.2 ± 5.2 mmHg before therapy significantly decreased to 16.9 ± 3.0 mmHg at the first month and 17.0 ± 3.1 at the sixth month ($p < 0.001$). The pretreatment CH (9.9 ± 2.1 mmHg) increased significantly after treatment at the first month (10.9 ± 1.9 mmHg), but there was no significant difference between pretreatment and sixth month (10.2 ± 2.1 mmHg). There were significant differences of other ORA parameters such as CRF (13.2 ± 2.3 ; 11.7 ± 2.4 ; 11.3 ± 2.6 mmHg). IOPg (26.2 ± 6.8 ; 18.5 ± 4.4 ; 19.0 ± 5.0 mmHg). IOPcc (25.7 ± 6.7 ; 18.0 ± 3.6 ; 19.2 ± 4.3 mmHg) were present between pre-treatment and post-treatment first and sixth months ($p < 0.001$).

Conclusion: Travoprost is found to be effective in lowering IOP at sixth month. It has CH-increasing effect obtained with

ORA after 1 month therapy period. but this effect was not sustained at sixth month. Travoprost also had CRF-decreasing effect during 6 months. Further large-scale studies with longer follow-ups are needed to elucidate effects of travoprost on the corneal biomechanical parameters.

P467 EFFECT OF PROSTAGLANDIN ANALOGUES ON FOVEAL THICKNESS AFTER PHACOEMULSIFICATION IN PATIENTS WITH OCULAR HYPERTENSION OR GLAUCOMA

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Background: This is a study to assess the impact on the foveal thickness of discontinuing treatment with prostaglandin analogues prior to cataract surgery in patients with glaucoma or ocular hypertension.

Methods: Prospective and randomized clinical study. We included 86 eyes of 78 patients with ocular hypertension or glaucoma in treatment with prostaglandin analogues, who underwent cataract surgery. Forty three eyes were assigned to group A and discontinued the treatment a week before the surgery and 43 were assigned to group B and instilled the prostaglandin analogue until the day before the surgery. Stratus OCT was performed before macular surgery and 6 weeks postoperatively to quantify the foveal thickness and to determine the appearance of cystoid macular edema (CME).

Results: The mean preoperative foveal thickness was $186.76 \pm 17.8 \mu\text{m}$ in group A and $185 \pm 15.7 \mu\text{m}$ in group B. The mean postoperative foveal thickness at 6 weeks was $197.73 \pm 22.9 \mu\text{m}$ in group A and $195.96 \pm 18.7 \mu\text{m}$ in group B. Foveal thickness increased on average about 10-11 μm after cataract surgery in both groups with no statistically significant difference among them. No difference in the incidence of cystoid macular edema was found among the groups.

Conclusion: Discontinuation of treatment with prostaglandin analogues prior to intraocular surgery does not influence in foveal thickness or postoperative CME after uneventful phacoemulsification in patients with glaucoma or ocular hypertension without other risk factors for postoperative CME.

P468 THE EFFECT OF TRAVOPROST AS INITIAL PROSTAGLANDIN ANALOGUE TREATMENT AND AFTER USE OF LATANOPROST IN JAPANESE GLAUCOMA PATIENTS

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Background: We investigated the efficacy of travoprost 0.004% benzalkonium chloride free ophthalmic solution compared with 1) treatment without prostaglandin analogues, and 2) previous use of latanoprost 0.005% on intraocular pressure (IOP) lowering effect in Japanese glaucoma patients.

Methods: 1) Comparison with treatment without prostaglandin analogues: nineteen eyes in 11 patients (averaged age: 63.0 ± 14.6 years old) were reviewed retrospectively. Thirteen eyes of primary open-angle glaucoma (POAG) (68.4%), 4 eyes of ocular hypertension (21.1%), 1 eye of primary angle-closure glaucoma (PACG) (5.3%), and 1 eye of sec-

ondary glaucoma (5.3%) comprised the clinical forms of glaucoma. 2) Comparison with previous use of latanoprost 0.005%: Thirty-five eyes in 20 patients (averaged age: 66.0 ± 12.8 years old) were reviewed retrospectively. Thirty eyes of primary open-angle glaucoma (POAG) (85.7%), 1 eye of primary angle-closure glaucoma (PACG) (2.9%), and 4 eye of secondary glaucoma (11.4%) comprised the clinical forms of glaucoma. IOP values were extracted at 8 ± 4 weeks after treatment of travoprost 0.004%.

Results: 1) Mean IOP was significantly reduced from 18.0 ± 4.4 mmHg at baseline to 13.4 ± 4.6 mmHg ($p = 0.0002$), and percent reduction was 25.1%. 2) Mean IOP was significantly reduced from 18.8 ± 5.1 mmHg at baseline to 15.9 ± 3.6 mmHg ($p = 0.0008$), and percent reduction was 8.6%.

Conclusions: These results suggests that travoprost 0.004% has IOP-lowering effect as initial prostaglandin analogue treatment, or even after use of latanoprost 0.005%.

P469 PROSTAGLANDIN ANALOGUES (PGAS) AND TIMOLOL FIXED COMBINATION (FC) VS. EXTEMPORANEOUS COMBINATION (EC) OR MONOTHERAPY (MT) IN THE TREATMENT OF PRIMARY OPEN-ANGLE GLAUCOMA (POAG) AND OCULAR HYPERTENSION (OHT): A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: PGAs are the first-choice drugs for the treatment of POAG and OHT. They are administered as Mt or as Fc or Ec with Timolol, a topical beta-blocker. Aim of this meta-analysis was to combine the results of the trials comparing the efficacy of Fc of Timolol and PGAs vs. Ec or vs. Mt.

Methods: MEDLINE and EMBASE were searched for articles published until May 2010. Randomized, controlled trials, comparing treatment with Timolol and PGAs Fc vs. Ec or vs. Mt in patients with POAG or OHT were considered eligible. Quality of studies was assessed using a modified Delphi list, whose score ranges from -15 to +15. The primary efficacy endpoint was the mean difference (MD) between arms of the diurnal intraocular pressure (IOP) reduction from baseline. The pooled estimates were calculated using random effects.

Results: Out of 855 retrieved articles, 15 were eligible accounting for a total of 22 comparisons: 18 assessing Fc vs. Mt, 4 Fc vs. Ec. The median quality score was 12 (range 5-15). Fc was more effective than both its components in Mt: Fc vs. Mt with Timolol (MD = -2.42, 95% CI -2.99,-1.85); Fc vs. Mt with PGAs (MD = -1.22, 95% CI -1.84,-0.59). When considering the type of PGAs given as Mt, the difference in efficacy between Fc and Latanoprost (MD = -1.21, 95% CI -1.75,-0.66) was smaller than in the comparison between Fc and Travoprost (MD = -2.14, 95% CI -3.05,-1.24). The only trial comparing Fc vs. Mt with Bimatoprost showed no significant difference (MD = -0.20, 95% CI -0.69, 0.29). Moreover, the comparison between Fc and Ec showed that Fc is less effective in reducing IOP than Ec (MD = 0.76, 95% CI 0.34, 1.17).

Conclusions: The results of this meta-analysis suggest that Fc are more effective than Mt, and Ec seems to have a greater extent of IOP reduction when compared with Fc.

P470 NON-CLINICAL EFFECTS OF TAPRENEPAG ISO-PROPYL (PF-04217329), A SELECTIVE EP2 AGONIST, AND ITS ACTIVE METABOLITE ON THE CORNEA

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Background: To determine the etiology of iritis, photophobia, and increase in corneal thickness observed in a FIH Phase 2 clinical trial of topical taprenepag in ocular hypertensive and primary open-angle subjects.

Methods: 1. Monkeys were dosed daily for 28 days in one eye with taprenepag and vehicle control in the other. Recovery following discontinuation of taprenepag was assessed for 28 days in the monkeys in the high dose group. Complete ophthalmic examinations including pachymetry and non contact endothelial cell specular microscopy was performed at baseline and weekly thereafter. The eyes were examined histopathologically and with transmission electron microscopy (TEM). 2. *In vitro* studies were performed with Skinethic corneal epithelial cultures and HCEC-12 human corneal endothelial cells. Test solutions included clinical formulations of taprenepag, its active metabolite (CP-544326) placebo controls, individual excipients, a structurally distinct EP2 agonist and Xalatan[®]. Four endpoints were evaluated: cell viability, transepithelial electrical resistance (TEER), histopathology, and TEM. 3. Cytokine induction after HCEC-12 and primary human monocyte exposure was measured with ELISA kits.

Results: Monkeys demonstrated a dose related incidence of iritis and an increase in corneal thickness. These adverse events resolved, as observed in the human clinical studies, within 28 days of discontinuing taprenepag. There was no evidence *in vivo* of taprenepag toxicity to the corneal endothelium or epithelium. However, TEER decreased after 4 hour exposure to either 0.02% BAC, Xalatan[®] or taprenepag. Cell viability of Skinethic stratified epithelial cells was affected primarily by excipients and was similar to Xalatan[®]. Viability of HCEC-12 cells was not affected by taprenepag up to 100 μ M. CP-544326 induced IL-6 release from HCEC-12 and IL-6 and IL-8 from human monocytes.

Conclusions: The lack of *in vivo* or *in vitro* endothelial cytotoxicity and the reversibility of the increase in corneal thickness and iritis in the monkey provide confidence to permit further clinical development of taprenepag.

P471 EFFICACY AND SAFETY WITH THE USE OF THE FIXED COMBINATION OF BIMATOPROST 0.03%/TIMOLOL 0.5% VERSUS THE FIXED COMBINATION OF LATANOPROST 0.005%/TIMOLOL 0.5% IN MEXICAN POPULATION

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Aim: To evaluate if the fixed combination of bimatoprost 0.03%/timolol 0.5% (GanfortTM) is more effective in lowering the intraocular pressure (IOP), than the fixed combination of latanoprost 0.005%/timolol 0.5% (XalacomTM), in patients with primary open-angle glaucoma.

Design: We present a longitudinal, prospective, clinical, comparative, open-label, randomized 3 month study.

Methods: 68 patients were studied. 34 were included in each group. 5 patients of each had a wash out period of 4 weeks before initiating the treatment. The rest were without previous treatment. All were evaluated once a month, for three months, at trough, 8 am before the instillation of that day's drop, and had a complete eye exam and monitoring of arterial pressure and cardiac rate. All patients concluded the study.

Results: The mean basal IOP of the XalacomTM group was 26.5 ± 2.59 mmHg, which dropped to 17.9 mmHg (\pm) at first month, and sustained in 17.06 ± 2.33 mmHg in third month. This represented a mean decrease of 9-57 or 35-9%. The mean of basal IOP for GanfortTM group was 26.9 ± 2.33 mmHg, which dropped to 16.5 at first month, and continued with 16.03 ± 2.0 mmHg in the second and third months. This decrease was 10.88 mmHg or 40.43% with a statistical difference of $p = 0.002$.

Conclusion: Once-daily treatment with GanfortTM was effective in lowering IOP 40.43% or 10-88 mmHg in patients with POAG or ocular hypertension in this 3 month study versus -9.56 mmHg or 35-9% in the XalacomTM group. We found no systemic adverse effects that necessitated removal of patients from study protocol, and local side effects were minimal and similar in both groups.

Medical Treatment: Carbonic Anhydrase Inhibitors

P472 THE FIXED COMBINATION OF DORZOLAMIDE/TIMOLOL AND THE ADDITION OF A PROSTAGLANDIN ANALOG OR BRIMONIDINE FOR THE TREATMENT OF GLAUCOMA: A FOUR-YEAR RETROSPECTIVE STUDY

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Background: Monotherapy is the recognized initial treatment for the treatment of glaucoma. It is now a frequent practice to use multiple treatments lowering intraocular pressure if monotherapy, does not succeed in IOP control. However, there is very little long-term evidence of the long term effect of use fixed combinations, such as Cosopt[®] (fixed combination of Dorzolamide 2% / Timolol 0.5%), with added medication in the form of prostaglandin analogs or Brimonidine.

Methods: In this retrospective, nonrandomized, descriptive clinical study, the long term response of the fixed combination of Dorzolamide/Timolol was evaluated in patients with primary open-angle glaucoma and the addition of other IOP lowering medications such as prostaglandin analogs and Brimonidine.

Results: 158 patients with POAG were evaluated (280 eyes). Patients were divided into three groups: a group with Cosopt only, a second group with prostaglandin analogs, and a third group with the addition of Brimonidine. IOP was reduced satisfactorily in all three groups. However, a progressive IOP reduction was noted in the group with the fixed combination plus prostaglandin analogs. In this group, a lack of long-term drift and a more homogeneous response of the reduction were also noted in comparison with the other groups.

Conclusions: We concluded that IOP reduction was efficacious in all three groups. The addition of prostaglandin ana-

logs showed progressive IOP reduction and absence of long-term drift. Brimonidine had a similar, but smaller effect.

P473 THE ANTIOXIDANT ACTIVITY OF DORZOLAMIDE AND TIMOLOL IN GLAUCOMA THERAPY

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Oxidative stress is a driving force for primary open-angle glaucoma. We tested the ability of Dorzolamide and Timolol, used in glaucoma therapy, to display antioxidant effects. Antioxidant activity of these two drugs was tested in trabecular meshwork specimens (TM) collected from corneal donors, pure TM cell lines composed of either young or senescent endothelial cells, and in subcellular systems composed of pure DNA and subcellular fractions containing or devoid of mitochondria. Oxidative stress was induced by hydrogen peroxide. Monitored end points included DNA fragmentation as evaluated by Halo test, oxidative DNA damage in terms of 8-oxo-2'-deoxyguanosine as evaluated by ³²P postlabeling, mitochondrial function as evaluated by MTT test. The antioxidant effect of Dorzolamide, was observed in TM tissue exposed at high doses of hydrogen peroxide. Timolol exerts a antioxidant activity protecting human endothelial cells, regardless of mitochondria presence. Conversely, the antioxidant effect of Dorzolamide was maximized in presence of mitochondria-containing subcellular fractions and in young endothelial cells, being scanty in senescent TM cells. In the subcellular system, the antioxidant effect of Dorzolamide was maximized in presence of mitochondria-containing subcellular fractions and in young endothelial cells possessing efficient mitochondrial function. Timolol antioxidant effect was direct while Dorzolamide needs the presence of intact mitochondria. Accordingly, Dorzolamide antioxidant effect is likely displayed mainly during early glaucoma phases when the molecular damage in trabecular meshwork is still low. Benzalkonium chloride, used as antiseptic in drug buffer preparation, consistently decreased the antioxidant effect of drugs and was per se able to induced oxidative DNA damage.

P474 SHORT-TERM EFFICACY AND SAFETY OF 1% DORZOLAMIDE HYDROCHLORIDE / 0.5% TIMOLOL MALEATE FIXED COMBINATION FOR LOWERING INTRAOCULAR PRESSURE IN GLAUCOMA PATIENTS

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Background: To evaluate the short-term efficacy and safety of 1% dorzolamide hydrochloride and 0.5% timolol maleate fixed combination (Cosopt®; MSD, Tokyo, Japan) for lowering intraocular pressure (IOP) in primary open-angle glaucoma (POAG) patients.

Methods: A total 31 glaucoma patients who started treating with Cosopt® eye drops from September 2010 to December 2010 at Kyoto Prefectural University Hospital and Oike-Ikeda Eye Clinic were retrospectively reviewed. Of those patients,

we enrolled 14 eyes of 14 POAG patients including normal-tension glaucoma (NTG) with no history of glaucoma surgery or laser eye operations within 6 months prior to the study (8 female, 6 male; 5 NTG, 9 POAG; mean age 68.5 ± 9.7 years old). Patients were divided into two groups; replacement group whose unfixed combination of beta-blockers and carbonic anhydrase inhibitors (CAIs; dorzolamide or brinzolamide) were replaced to Cosopt® (n = 6; 4 female, 2 male; 3 NTG, 3 POAG; mean age: 69.8 ± 8.0 years old) and add-on group who received Cosopt® as their add-on therapy to their original medication (n = 8; 4 female, 4 male; 2 NTG, 5 POAG; mean age: 67.5 ± 11.3 years old). The beta-blockers or CAIs were stopped when they started Cosopt® if the patients used them in the add-on group. The IOP and the daily frequency of eye drop administrations were compared between the pre- and post-Cosopt® treatment. Right-eye data was analyzed if patients used Cosopt® for both eyes, and the paired-t test was used for the statistical analysis.

Results: The IOP at pre-treatment and at 1 month after the initiation of treatment with Cosopt® were 14.5 ± 4.6 , 13.4 ± 3.0 mmHg respectively (p = 0.2116, whole subjects), 13.8 ± 6.2 , 13.0 ± 2.2 (p = 0.6904, replacement group), and 15.0 ± 3.2 , 13.6 ± 3.6 (p = 0.0543, add-on group). The daily frequency of eye drop administrations decreased significantly from 5.7 ± 2.0 times per day to 3.5 ± 1.8 times per day in replacement group (p = 0.00089), while it increased significantly from 2.0 ± 0.9 to 2.8 ± 0.5 in add-on group (p = 0.0479). Three subjects experienced several side effects such as palpitation (n = 1) and progression of superficial punctate keratitis (n = 2).

Conclusion: The findings of this study showed that Cosopt® has benefits not only in IOP lowering effects equivalent to the unfixed combination, but also in decreasing the frequency of daily eye drop administrations.

Medical Treatment: Ocular Perfusion and Blood Flow

P475 INTRAVITREAL ANTI-VEGF INJECTIONS INDEPENDENTLY DECREASE OCULAR PERFUSION PRESSURE AND INCREASE INTRAOCULAR PRESSURE

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Background: Previous studies have found that intravitreal anti-VEGF injections can decrease retinal arteriolar caliber and increase intraocular pressure. Blood flow into the eye is driven by ocular perfusion pressure (OPP). OPP is the difference between mean central artery pressure and intraocular pressure (OPP = MCRAP – IOP). If anti-VEGF agents can alter retinal vessel caliber and increase IOP, what effect are they having on OPP? To answer this question, MCRAP and IOP was measured pre and post anti-VEGF injection.

Methods: In twenty-six eyes of twenty-six patients undergoing intra-vitreal anti-VEGF injections for neovascular macular degeneration, upright ipsilateral mean brachial blood pressure (MBBP), MCRAP and IOP were measured pre and post injection. OPP was calculated. Institutional Review Board and written informed consent were obtained. MCRAP was

measured optically using the principle of oscillometry to capture central retinal artery pulsations and blood flow (See Figure 1).

Results: Average age was 79.4 ± 3.6 years. Average upright mean brachial artery blood pressure was 92.4 ± 4.1 mmHg. Post injection the average decrease in MCRAP was 9.3 ± 6 mmHg ($p = 0.003$), IOP increase 11.6 ± 3.5 mmHg ($p < 0.0001$) and OPP decrease 13.5 ± 6.1 mmHg ($p < 0.0001$). There was no significant correlation between the increase in IOP and the decrease in MCRAP ($r^2 = 0.18$). In 18 eyes the IOP increased and the MCRAP decreased. In 2 eyes the OPP decreased to zero. Six eyes with abnormal pre-injection MCRAP and OPP were evaluated for carotid vascular stenosis.

Conclusions: Intra-vitreous anti-VEGF injections can increase IOP and decrease MCRAP causing decreased ocular perfusion. Decreased ocular perfusion post injection in the setting of preexisting vascular stenosis increases the risk of CRAO. The lack of correlation between the post-injection IOP increase and the MCRAP decrease suggest different mechanisms of action. The IOP increase maybe volume related and/or an effect on outflow facility. The decrease in MCRAP is likely due to changes in vessel caliber. The results from this study along with observations from previous studies suggest anti-VEGF agents maybe vasoactive. Because the magnitude of IOP increase and MCRAP decrease are not correlated, monitoring IOP alone is not enough to maximize the safety of injection. If both the IOP increases and MCRAP decreases, aggressive treatment of IOP may be required to restore normal ocular perfusion. This is critical to preserve ocular function in an eye with glaucoma. Use of this technology pre and post injection can identify ocular perfusion abnormalities and monitor the effectiveness of treatment to lower IOP and restore normal ocular perfusion.

P476 ASSOCIATION BETWEEN ONH BLOOD FLOW AND MEAN ARTERIAL BLOOD PRESSURE IN PATIENTS WITH GLAUCOMA, OCULAR HYPERTENSION AND HEALTHY CONTROL SUBJECTS

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Background: Previous studies have suggested that autoregulation, defined as the ability to keep blood flow constant despite changes in perfusion pressure, is impaired in patients with glaucoma. In the current study we use pressure / flow relationships to investigate the autoregulatory properties of the optic nerve head circulation in patients with treated and untreated glaucoma patients and ocular hypertension and compared them to healthy subjects.

Methods: 136 patients with treated primary open-angle glaucoma (POAG), 116 patients with untreated POAG, 138 patients with ocular hypertension and 160 control subjects were included in the study. Optic nerve head blood flow was measured using laser Doppler flowmetry. Mean arterial blood pressure (MAP) was measured non-invasively using automated oscillometry and intraocular pressure (IOP) was measured using applanation tonometry. Ocular perfusion pressure (OPP) in the sitting position was calculated as $OPP = 2/3 \cdot MAP - IOP$.

Results: Optic nerve head blood flow was highest in healthy subjects, followed by ocular hypertensives. Optic nerve head

blood flow was significantly reduced in patients with glaucoma compared to patients with ocular hypertension and healthy subjects ($p < 0.01$). The association between OPP and optic nerve head blood flow was highest in untreated glaucoma patients ($r = 0.311$) followed by ocular hypertensives ($r = 0.241$) and treated glaucoma patients ($r = 0.212$). The lowest correlation between optic nerve head blood flow and OPP was found in healthy subjects ($r = 0.165$).

Conclusions: The present study confirms previous reports that optic nerve head blood flow is reduced in patients with POAG and patients with ocular hypertension. Correlation coefficients in the glaucoma groups and in the ocular hypertensives indicate a vascular dysregulation in these patients compared to healthy control subjects. Furthermore, our data indicate that this vascular dysregulation may be at least partially caused by increased IOP.

Medical Treatment: Neuroprotection

P477 MEMANTINE IN THE TREATMENT OF ADVANCED GLAUCOMA. CLINICAL OBSERVATIONS

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Background: Glaucoma is a neurodegenerative disease characterized by progressive loss of retinal ganglion cells. Excitotoxicity describes the process of neuronal injury by excess stimulation of amino acid receptors. High levels of glutamate can be toxic to retinal ganglion cells. Memantine, an uncompetitive, low-affinity, open-channel calcium blocker, enters the receptor-associated ion channel when it is excessively open.

Methods: At our hospital patients with advanced glaucoma damage and increasing visual field loss were treated with memantine. The intraocular pressure must be stable (≤ 15 mmHg) with or without local medications. The therapy with memantine starts with a dosage by 5mg/d at the first week and will increased on 10 mg 2 x daily within 4 weeks.

All patients underwent ophthalmologic examinations (visual acuity, refraction, slit lamp and fundus examination), achromatic perimetry and visually evoked potentials before treatment with memantine and every three month during the therapy.

The statistic analysis took place with the Wilcoxon-test (side comparison).

Results: We found a stabilization in visual fields in one year. The statistic analysis of the parameter Mean deviation as well as Loss Variance after 3 months, 6 months, 9 months as well as after 12 months therapy took place. We found no statistically significant change (no worsening) of the parameters at each time points ($p > 0.05$). The therapy was well tolerated by most patients (90%).

Conclusion: A systemic therapy with memantine seems to slow progression of the visual field defects in patients with advanced glaucoma.

P478 IDEBENONE PREVENTS HUMAN OPTIC NERVE HEAD ASTROCYTES FROM OXIDATIVE STRESS, APOPTOSIS, AND SENESCENCE BY STABILIZING BAX/BCL-2 RATIO

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Purpose: Primary open-angle glaucoma is one of the leading causes of blindness. Oxidative stress plays an important role in the pathogenesis of this neurodegenerative disease. This study investigates the possible anti-apoptotic and cytoprotective effects of idebenone on optic nerve head astrocytes (ONHA) under oxidative stress.

Methods: ONHA were treated with 1 to 150 μM idebenone. Cell viability (tetrazolium dye-reduction assay and live-dead assay), induction of intracellular reactive oxygen species (ROS), senescence-associated β -galactosidase (SA β -Gal) activity, apoptosis (detection of histone-associated DNA fragmentation), and expression of BAX and Bcl-2, two key modulators of apoptosis, and their mRNA were determined after 48 h and after H_2O_2 treatment.

Results: Idebenone concentrations from 1 to 50 μM showed no toxic effects on ONHA. Pretreatment with 7.5 to 15 μM idebenone led to an increase in viability of ONHA after H_2O_2 treatment. In addition, idebenone pretreatment significantly attenuated the increase of histone-associated DNA fragmentation, induction of SA β -Gal, and intracellular ROS after treatment with H_2O_2 . When ONHA cells were treated with idebenone and H_2O_2 , RT-PCR and Western blot analysis yielded an increased expression of Bcl-2 and a decrease of BAX compared to those cells that were treated with H_2O_2 only.

Conclusion: In this study idebenone reduced senescence, oxidative stress, and apoptotic cell death in cultured ONHA *in vitro*. Our results suggest that idebenone may help to protect ONHA *in vivo*, and therefore might be helpful in preventing the progression of glaucomatous degeneration.

P479 THE SEARCH FOR POTENTIAL NEUROPROTECTIVE AGENTS IN GLAUCOMA THERAPY: IS AYURVEDA'S CURCUMIN IN A COMPLEX WITH OMEGA-3 EPA/DHA AND PHOSPHOLIPIDS ONE FUTURE DIRECTION?

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Background: While reduction of intraocular pressure (IOP) remains the clinician's principal method to treat glaucoma, such treatment is often partly effective. Neuroprotective agents would allow therapy at a common endpoint of this neurodegenerative disease by rescuing dying cells no matter the nature of the primary insults, and by protecting as yet unaffected neurons from that insult. Since the time of Ayurveda (1900 BC), numerous therapeutic activities have been assigned to Tumeric (Curcuma Xanth. L.). Extensive research within the last half century has proven that most of these activities are due to Curcumin.

Methods: A systematic search of the Medline database using Pubmed website for the years 1970 through December 2010, was conducted. In addition, the concentration of Curcumin in the serum after oral intake of 500 mg Curcumin95 and 2 capsules of *Neuroprotekt*TM (complex of 250 mg Curcumin 95, 250 mg Omega-3 DHA/EPA, phospholipid Eucerit200TM) have been measured.

Results: Ongoing clinical trials with Curcumin in patients with Alzheimer Disease, a neurodegenerative disease which has been linked to glaucoma, show borderline significant efficacies. In addition, in more than 80 studies on animal models

of different neurodegenerative diseases, Curcumin enhanced neuronal survival by its potential to influence the different mechanisms of neuronal cell loss. Thereby, Curcumin has shown beneficial effects in most of the mechanisms which are involved in the development and progression of glaucoma that could be targets for pharmacological interventions. Reported targets with which Curcumin directly or indirectly interacts or binds are β -amyloid, cyclooxygenase (COX)-2, xanthine oxidase, DNA polymerase, glutathione, albumin, tubulin, metal ions, transcription factors, glutathione reductase, growth factors, antiapoptotic proteins, inflammatory mediators, and angiogenesis biomarkers. Curcumin is a strong antioxidant and free-radical scavenger, an upregulator of defensive genes and proteins, and a nitric oxide synthase inhibitor. Curcumin is effective in the NMDA-induced damage of cultured retinal cells and is effective on the pro-inflammatory cytokines and against glutamate toxicity, attributed to increased brain-derived neurotrophic factor (BDNF) levels. Curcumin inhibits lipid peroxidation and secretion of cytokines such as TNF- α . Curcumin attenuates mitochondrial dysfunction and is reducing reperfusion injury in focal cerebral and retinal ischemia and modulates the cell survival and death signalling pathways by involving Bcl-2, cytochrome-c and caspase-activity. Curcumin has a selective growth-inhibitory effect on glial cell modulation and affects β -amyloid, suppressing oxidative damage and inflammatory signaling pathways. Our lab results showed, that bioavailability of Curcumin could be significantly increased by making complexes with Omega-3 and phospholipids.

Conclusions: Curcumin could be considered as a neuroprotective candidate in glaucoma, since Curcumin: binds to specific and relevant molecules on the target tissue – has adequate penetration to reach the target tissue in pharmacologically effective concentrations, and – enhance neuronal survival and decrease neuronal damage in animal models. With so much potential, the argument for Curcumin's development for glaucoma is compelling. In Germany, *Neuroprotekt*TM (Nutrition, Science & Health, Munich, Germany) is being used in addition to IOP reduction by more than 80 Ophthalmologists so far. A clinical trial on patients with glaucoma is on its way.

P480 PROTEIN KINASE INHIBITORS AS NEUROPROTECTIVE AGENTS FOR THE TREATMENT OF GLAUCOMA

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Background: Although lowering IOP is often effective in slowing down or preventing further optic nerve damage in glaucoma, sometimes it is not possible to lower the IOP sufficiently, and sometimes even with significant IOP lowering retinal ganglion cell (RGC) loss continues. In an effort to complement IOP-based therapies, we have been working to develop neuroprotective strategies for glaucoma treatment. We have performed a high-content screen (HCS) to identify small molecules that can promote RGC survival and neurite outgrowth.

Methods: Primary murine RGCs were purified with anti-Thy1.2 immunopanning, and used to screen various com-

pound libraries with an image-based assay. Identified compounds were investigated by gene expression profiling and phospho-protein analysis. Structural analogs of drug leads were synthesized to study structure-function relationships. RGC survival promoting activity *in vivo* was tested using animal models of optic nerve injury.

Results: Of the molecules identified by the HCS, one of the most potent at promoting RGC survival and neurite outgrowth is the broad-spectrum receptor tyrosine kinase inhibitor sunitinib, an FDA approved drug that is used for the treatment of a variety of cancers. Sunitinib strongly promotes RGC survival *in vitro*, and protects RGCs from NMDA excitotoxicity and axon injury-associated degeneration *in vivo*. Sunitinib can induce changes in the phospho-protein signaling network that favors the inhibition of cell death pathway and stimulation of pro-surviving pathway simultaneously. Screening for additional neuroprotective compounds is continuing, as are further studies designed to define the neuroprotective mechanism(s) by which sunitinib and related kinase inhibitors promote RGC survival.

Conclusions: Protein kinase inhibitors appear to be promising leads for the development of possible neuroprotective drugs for the treatment of glaucoma and other optic nerve diseases.

P481 MELATONIN INCREASES RETINAL GANGLION CELL SURVIVAL IN ISCHEMIC RAT RETINA

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Purpose: To determine whether melatonin increase retinal ganglion cell (RGC) survival in ischemic rat retina.

Methods: Sprague-Dawley rats received intraperitoneal injections of melatonin (5 mg/kg) or vehicle and then transient retinal ischemia was induced by acute IOP elevation. RGC survival was measured after Fluoro-Gold labeling. Glial fibrillary acidic protein (GFAP) protein expression and distribution were assessed at 12 hours after ischemia-reperfusion by Western blot and immunohistochemistry.

Results: GFAP protein expression was significantly increased in the early neurodegenerative events (within 12 hours) of ischemic rat retina. The treatment of ischemic rat retina with melatonin resulted in a decrease in the GFAP protein expression and an increase of RGC survival at 2 weeks after ischemia.

Conclusions: These findings suggest that altered GFAP activity following acute IOP elevation may be an important component of a biochemical cascade leading to RGC death in ischemic retina. Thus, these results support further studies to determine whether decreased activity of Müller cells by melatonin may provide a novel mechanism to protect RGCs against pressure-related ischemic damage.

P482 NEUROPROTECTIVE EFFECTS OF EXOENZYME C3 TRANSFERASE IN EXCITOTOXIC OPTIC NEUROPATHY

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Background: To evaluate the neuroprotective effects of exoenzyme C3 transferase (C3) on N-methyl-D-aspartate (NMDA)-induced neurotoxicity in the rats.

Methods: C3 was expressed in E.coli, purified by affinity chromatography, and injected intravitreally into rat eyes treated with or without NMDA. At various time points after injection, eyes were nucleated. Western blot analysis of Rho levels was performed on homogenized retinas to confirm Rho inhibition by C3. Terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) and cresyl violet staining were performed on retina flat-mounts. TUNEL positive cells or cresyl violet-stained cells were counted. Hematoxylin/eosin (HE) staining was also performed on retina cross-sections for morphological analysis.

Results: Western blot showed that Rho expression in rat retinas was inhibited for 2 days after intravitreal injection of C3. Intravitreal injection of NMDA induced apoptosis of neurons within the ganglion cell layer (GCL), accompanied by reduction of cell density in the GCL and decrease in inner plexiform layer (IPL) thickness. Co-injection of C3 reduced retinal ganglion cell (RGC) apoptosis, and increased neuronal density in the GCL and IPL thickness.

Conclusions: C3 protected the retina from excitotoxic damages induced by NMDA. C3 might be used in glaucoma treatment, not only for its IOP lowering effects, but also for its neuroprotective potential.

P483 NEUROPROTECTIVE EFFECT OF FASUDIL FOR RETINAL GANGLION CELLS AND ITS MECHANISM RESEARCH IN RAT ACUTE ELEVATED INTRAOCULAR PRESSURE

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Backgrounds: To investigate the neuroprotective effect of fasudil for retinal ganglion cells (RGCs) and its mechanism research in rat acute elevated intraocular pressure (IOP).

Methods: 24 SD rats were divided into 4 groups at random: N group (normal), M group(model), MP group (model+PBS: began PBS i.p. 300mg*kg⁻¹ Q.d. a week before the operation) and F group (model+Fasudil: began Fasudil i.p. 300mg*kg⁻¹ Q.d. a week before the operation). Excavating their eyeballs and collecting blood from their hearts 7th day after the operation, TUNEL was employed to observe apoptosis of RGCs, immuno-histological assay to carry out on paraffin sections of retina and to research the distribution and expression of ROCK-2 and ET-1, western blotting to view the expression of p-MYTP-1, radio-immunity assay to survey the content of ET-1 in blood plasma, and blood rheometer to measure the blood viscosities, blood cell aggregation index (BCAI) and hematocrit (HCT).

Results: In N group, ROCK-2 or ET-1 was only distributed in ganglion cells layer (GCL) and not found in other layers. The distribution of ROCK-2 in M or MP group was in GCL, inner plexiform layer (IPL), inner nuclear layer (INL), outer plexiform layer (OPL) and outer nuclear layer (ONL), and ET-1 was in GCL, IPL, INL, OPL but not ONL. In M or MP group, the average optical density (AOD) of ROCK-2 and ET-1 in retina, the expression of p-MYTP-1 in retina and ET-1

in blood plasma, and the blood viscosities, BAI and HCT were all obviously increased compared with N group ($p < 0.05$), but there was no significant difference between them ($p > 0.05$). In F group, the distribution of ROCK-2 and ET-1 was the same as M or MP group, but their AOD in retina, the expression of p-MYTP-1 in retina and ET-1 in blood plasma, and the blood viscosities, BAI and HCT, and RGCs apoptosis index (AI) were all prominently decreased compared with M or MP group ($p < 0.05$).

Conclusion: Fasudil could produce neuroprotective effect probably owing to inhibiting ROCK-2, decreasing p-MYTP-1, reducing actin-myosin cross link, restraining smooth muscle contraction, diminishing ET-1, suppressing vasoconstriction, depressing blood viscosity, raising blood flow, enhancing blood and oxygen quantity within eye balls and lessening the apoptosis of RGCs.

Medical Treatment: Gene Therapy

P484 INCREASED RESISTANCE TO OXIDATIVE DNA DAMAGE OF TRABECULAR MESHWORK CELLS BY E. COLI FPG GENE TRANSFECTION

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Oxidative damage plays a pathogenic role in various chronic degenerative diseases. Oxidative damage targeting trabecular meshwork (TM) cells as a consequence of mitochondrial damage is a pathogenic mechanism for glaucoma, the most common cause of irreversible blindness worldwide. Consequences of oxidative damage are attenuated by endocellular activities involved in scavenging reactive oxidative species and DNA repair. Selected bacterial genes are highly efficient at protecting cells from oxidative DNA damage. This situation occurs for *Escherichia coli* formamidopyrimidine DNA glycosylase (FPG), a major DNA glycosylase that repairs oxidatively damaged DNA. Accordingly, we initiated this study aimed at transfecting TM cells with Fpg in order to increase their resistance to oxidative damage. TM cells were transfected with pEGFP-C1-FPG vectors by lipofectamine. Transfected cells were identified and collected by FACS. Oxidative DNA damage was evaluated in FPG-transfected as compared to vector only-transfected TM cells by endonuclease digestion at abasic sites, alkali denaturation and biochip capillary electrophoresis. TM cells were found to be quite resistant to gene transfection as compared to other cell types. FPG-transfected TM cells have a significantly decreased amount of oxidative DNA damage as compared to their wild-type counterparts. In fact, DNA fragmentation resulting from apurinic site formation was 36% lower in Fpg+ than in Fpg- cells ($p < 0.05$). This study demonstrates that it is feasible to increase resistance of TM cells to endogenous oxidative damage by gene transfection. These findings bear relevance for primary and secondary prevention of degenerative glaucomas and other degenerative diseases where oxidative damage plays a pathogenic role.

Medical Treatment: Investigational Drugs; Pharmacological Experiments

P485 IOP-LOWERING EFFECT OF PROSTANOID EP RECEPTOR AGONIST IN COMBINATION WITH FP RECEPTOR AGONIST

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Purpose: Prostanoid EP2 and EP4 receptor agonists have been reported to lower intraocular pressure (IOP). We also reported that selective agonists of EP2 and EP4 receptor reduced IOP in a dose-dependent manner in mice. However, combined effect of EP receptor agonists on IOP reduction with other ocular hypotensive agents has not been clarified. The purpose of this study is to investigate combined effect on IOP reduction by EP receptor agonists and a first-line drug, FP receptor agonist, in mouse eyes.

Method: A single drop with 3 microL aliquots of 0.1% ONO-AE1-259 (EP2 agonist; EP2), 0.1% ONO-AE1-329 (EP4 agonist; EP4), 0.005% latanoprost (FP agonist; LAT) and 5% DMSO as a vehicle solution (DMSO) were topically applied into randomly selected one of two eyes in ddY mouse. To clarify combined effect of EP2 and EP4 with LAT, LAT or DMSO was concomitantly applied 30 min before application of DMSO, LAT, EP2 or EP4. Two hours later, IOP was measured with a microneedle method and IOP reduction was evaluated by the difference between IOP of the treated eye and that of the contralateral control eye.

Result: IOP reduction by a single application of DMSO, EP2, EP4 and LAT were -0.8%, 9.8%, 7.8%, and 17.3%, respectively. EP2, EP4 and LAT significantly reduced IOP ($p < 0.01$ v.s. DMSO by Dunnett test, $n = 10$). IOP reduction by a concomitant administration of LAT/EP2, LAT/EP4, LAT/LAT, LAT/DMSO and DMSO/DMSO were 17.1%, 23.8%, 18.3%, 15.2%, and 1.4%, respectively. Among them, LAT/EP4 showed significant more IOP reduction than LAT/DMSO ($p < 0.05$).

Conclusion: Additive effect on FP agonist-induced IOP reduction was induced by EP4 agonist, but not by EP2 agonist in mice. EP4 agonist may be expected to be a useful therapeutic agent for IOP reduction in combination with FP agonist.

P486 INTRAMUSCULAR CITICOLINE (CITIDIN-5-PHOSPHOCHOLINE) IS ABLE TO REDUCE PERIMETRIC DEFECTS IN PRIMARY OPEN-ANGLE GLAUCOMA PATIENTS WITH PHARMACOLOGICALLY CONTROLLED INTRAOCULAR PRESSURE. STUDIES ON MECHANISM OF ACTION

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Background: Citicoline represents a passage in the formation of some classes of phospholipids fundamental for the structure and function of neuronal membranes. It has been favorably employed as an anti-ischemic agent in processes of cerebral ageing and in the treatment of both acute and chronic vasculopathies. The action of citicoline in reducing

perimetric defects in Primary Open-Angle Glaucoma (POAG) patients was evidenced by Virno et al. in 1988 at the Department of Glaucoma and Ocular Physiopharmacology of the University of Rome 'La Sapienza'. Aim of the present study was to investigate on the mechanism of action by which citicoline affects the visual field by means of both clinical and experimental techniques.

Methods: *Clinical investigation:* 98 patients (196 eyes), range 55-82 years, suffering from POAG, whose intraocular pressure was pharmacologically controlled (within 18 mmHg) but showed a progression of perimetric defects, were treated intramuscularly for 15 consecutive days with 1000 mg citicoline. Humphrey 30-2 full threshold test was performed at baseline (at least 2 to 3 tests) and after 15, 30, 60, 120 and 180 days from beginning of treatment. A double-blind study versus placebo (physiological saline) was performed in 45 POAG patients prior to and after 15 days of the treatment. Moreover, 20 POAG patients were submitted to the 'Blue Field' endoptic technique after intravenous administration of 1000 mg citicoline and prior to and after the treatment blood systemic pressure and retinal blood flow were measured. *Experimental investigation:* a continuous electromanometric recording of both intraocular pressure (IOP) and systemic blood pressure was performed in 22 anesthetized animals (rabbits) following the intravenous administration of 50 mg/Kg of body weight of citicoline.

Results: *Clinical investigation* After 30 days of intramuscular treatment with 1000 mg citicoline a statistically significant ($p = 0.01$) improvement of Mean Deviation (MD) was observed in 183 POAG lasting 3 to 6 months: The citicoline administration was repeated every 3 to 6 months according to the response obtained. The double-blind study versus placebo evidenced a statistically significant ($p > 0.005$) improvement in MD in 22 citicoline treated POAG patients versus 23 untreated POAG patients. The intravenous administration of 1000 mg citicoline in 20 POAG patients induced a statistically significant ($p < 0.05$) mean increase both of retinal blood flow and systemic blood pressure. *Experimental investigation:* the continuous electromanometric recording of both IOP and systemic blood pressure in 22 anesthetized rabbits evidenced a mean increase (10 ± 1.88 mmHg) in mean systemic blood pressure following the intravenous administration of 50 mg/Kg body weight of citicoline.

Conclusion: The intramuscular administration of citicoline at the dose of 1000 mg for 15 consecutive days, repeated every 4 to 6 months is able to reduce perimetric defects in POAG patients with pharmacologically controlled IOP but showing a progression of the disease. On the basis of both clinical and experimental data the mechanism of action by which the drug intervenes in restoring part of the visual field in POAG is referable to an increase in perfusion pressure at the level of the intraocular microcirculation 'anti-ischemic action'.

P487 THE EFFECT OF INTRA-OPERATIVE USE OF TOPICAL MITOMYCIN-C ON INTRA-OCULAR PRESSURE IN PATIENTS WITH PTERYGIUM EXCISION

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Background: Topical Mitomycin-C (MMC) is utilized in both glaucoma filtering and pterygium excision surgeries. However

hypotony is an important effect observed in the former, while there is scarcity of evidence to the effect in the latter. The aim of the present study was to determine the effect on Intraocular Pressure (IOP) in patients undergoing pterygium excision with intraoperative use of adjunctive topical MMC

Methods: This was a descriptive, interventional case series of 102 patients (118 eyes) with different grades of pterygium. All patients were assisted at the Ophthalmology Department from 1995 up to 2008 that, having met other inclusion criteria, underwent pterygium excision with adjunctive MMC. Intraoperative topical MMC in a dosage of 0.2 mg/ml was administered between 1 and 5 minutes and changes in IOP were noted on day1, day7 and 3 months. Data were analyzed using proportion, group means, standard deviations, and analysis of variance (ANOVA) and paired student t test.

Results: There was no significant decline in IOP in patients throughout the follow-up period ($p = 0.435$, student t test). After 3 months post-operatively, 109 eyes (92.4%) had no change in IOP of greater than 5 mmHg. Seventy-eight eyes (72%) experienced minimal change in IOP which was not considered statistically significant followed by 31 eyes (28%) that experienced no change in IOP at 3 months.

Conclusion: Intra-operative topical administration of MMC has minimal effect in lowering IOP in pterygium patients. These results do not seem to support a transscleral effect of MMC on the ciliary body as an IOP lowering mechanism, suggested in the glaucoma filtering surgery.

P488 NEW THERAPIES FOR GLAUCOMA TREATMENT BASED ON TOPICALLY ADMINISTERED siRNAs

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Background: To find a new treatment for ocular hypertension and open-angle glaucoma based on topical administration of small interference RNAs (iRNAs) targeting different genes involved in control of intraocular pressure (IOP). Different siRNAs were designed to target 24 genes involved in intraocular pressure (IOP) regulation. Efficacy of these siRNAs was demonstrated in several validated in vitro and in vivo models.

Methods: Several siRNA sequences, previously validated by in vitro assays, were tested in vivo in normotensive and hypertensive models of New Zealand White rabbit to analyze their effect on IOP. The siRNAs were administered daily as eye drops. Different experiments were performed to evaluate: maximal IOP reduction, longest-lasting time effect, potential for long term treatments, dose-response studies, optimal administration pattern, analysis of in vivo downregulation and preliminary toxicology studies. As controls for in vivo studies, both commercial drugs and scrambled siRNAs, were analyzed.

Results: Different siRNA sequences were demonstrated to effectively reduce elevated IOP and to exhibit much longer lasting effect than commercial drugs. Targeted genes in these studies included carbonic anhydrases, Adrenergic receptors (ADRs), Acetyl-cholinesterase, ELAM-1, Cyclooxygenase, Angiotensin receptors, angiotensin converting enzyme (ACE), renin, Cochlin, ATPases and 11-Hydroxysteroid dehydrogenase (HSD). IOP decrease depends on the targeted gene and the siRNA sequence used, causing an IOP decrease of between 10 and 30 %, with the effect lasting

between 30 and 110 hours. The siRNA sequences targeting ADRs, carbonic anhydrases, ATPases and Cochlin genes achieved the highest IOP reduction and longer-lasting effects whereas the siRNAs with lower efficacies were those targeting Angiotensin receptors. Rabbits were treated daily with several siRNAs during one month of and the IOP decrease was maintained with no rebound effect on discontinuation. No side-effects were observed after or during treatment. The *in vivo* analysis of gene expression of some of these sequences showed a clear reduction of mRNA levels in the ciliary body of treated animals. On the other hand, the preliminary toxicology experiments showed no toxicological effects resulting from siRNA administration.

Conclusions: These results postulate topically administered siRNAs targeting several genes as potential new therapeutic treatments for ocular hypertension and open-angle glaucoma. The IOP decrease obtained with specific siRNAs is similar to that produced by commercial drugs but siRNA treatment shows a generalized longer lasting effect when compared to commercials.

P489 PYM50018 AND PYM50028, ORALLY ACTIVE NEUROTROPHIC FACTOR MODULATORS, PROTECTS RAT RETINAL GANGLION CELLS FROM GLUTAMATE-INDUCED NEURONAL DAMAGE *IN VITRO*

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Background: Glaucoma is a neurodegenerative disorder characterised by the progressive death of retinal ganglion cells (RGCs) and, in animal models, this loss can be prevented by application of neurotrophic factors, including brain-derived and glial cell line-derived neurotrophic factor (BDNF and GDNF). PYM50018 and PYM50028 are orally active neurotrophic factor modulators. In addition, PYM50028 is currently being evaluated in a Phase II clinical study in Parkinson's disease patients. PYM50018 and PYM50028 are neuroprotective in a range of neuronal cell types including dopaminergic, cortical and motor neurones and are active in preclinical models of Parkinson's disease, Alzheimer's disease and amyotrophic lateral sclerosis, suggesting a potential therapeutic benefit in several neurodegenerative conditions. However, their effect in glaucoma has not been evaluated to-date. This study investigated the neuroprotective effect of PYM50018 and PYM50028 in rat RGCs exposed to glutamate, a model of glaucoma *in vitro*.

Methods: Cultured RGCs were prepared from 7-day old Long Evans rat pup retinas. Dissociated RGCs were cultured at a density of 200000 cells/well in 96 well-plates (pre-coated with poly-L-lysine) at 37°C in a humidified air (95%)/CO₂ (5%) atmosphere in Neurobasal medium supplemented with B27 (2%), L-glutamine (0.2 mM), penicillin/streptomycin solution (1%), ciliary neurotrophic factor (40 ng/ml), BDNF (10 ng/ml) and fibroblast growth factor basic (10 ng/ml). Every two days, half of the medium was replaced with fresh medium. After 3 days, cultures were exposed to glutamate (40 µM, 20 min). Cultures were incubated for 24 h with PYM50018 and PYM50028 either immediately before glutamate exposure (prevention) or immediately after glutamate exposure (reversion). BDNF (50 ng/ml) was used as a reference compound. Twenty-four hours after glutamate exposure cells were fixed

in paraformaldehyde (3%) and permeabilised with saponin. Neurones were stained with mouse monoclonal primary β-tubulin followed by Alexa Fluor 488 goat anti-mouse IgG to visualise them. Nuclei of neurones were labelled using Hoechst solution. Six wells per condition per culture were used and 3 independent cultures performed. Neuronal survival was assessed using 10 pictures/well with an InCell Analyzer™ 1000 with 20x magnification. Statistical analysis was performed using a one-way ANOVA followed by Fisher's PLSD *post-hoc* test.

Results: Glutamate (40 µM, 20 min) significantly reduced RGC survival by ~25% (*p* < 0.001). Pretreatment of RGCs for 24 h with PYM50018 (300 nM), PYM50028 (300 nM) or BDNF (50 ng/ml) significantly increased cell survival to 92%, 90% and 96% of control respectively (all *p* < 0.001). Treatment with PYM50018 (3 and 30 nM) for 24 h after glutamate exposure significantly increased cell survival to 88% and 90% of control respectively (both *p* < 0.001). Treatment with PYM50028 (3, 30 and 300 nM) or BDNF (50 ng/ml) for 24 h after glutamate exposure all significantly increased cell survival to 83% of control (all *p* < 0.05). PYM50018 (300 nM) increased cell survival to 79% of control but this was not statistically significant (*p* = 0.126).

Conclusion: PYM50018 and PYM50028 significantly reduced glutamate-induced neuronal damage in rat RGCs and were neuroprotective when applied either before or after glutamate exposure. These results support the development of these compounds as a treatment for glaucoma.

P490 EVALUATION OF NEWLY DEVELOPED CATIOPROST®, A PRESERVATIVE-FREE CATIONIC EMULSION OF LATANOPROST IN AN *IN VITRO* CORNEAL WOUND HEALING MODEL

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Background: Ocular Surface Disease (OSD) negatively impacts life quality and jeopardizes long-term glaucoma therapy of approximately 60% of glaucoma patients. Therefore, there is a need for preservative-free anti-glaucoma therapies to avoid triggering or worsening of OSD upon treatment. Ideally, such therapies should also possess ocular surface (OS) protection properties to treat OSD. Therefore, Catioprost®, a benzalkonium chloride (BAC)-free cationic emulsion of 0.005% latanoprost was developed. Indeed, cationic emulsions (e. g., Cationorm®) were shown to have OS protection properties improving signs and symptoms of dry eye in clinical trials. Previous preclinical data demonstrated the ocular safety, efficacy and healing properties of Catioprost® and confirmed the deleterious effects of BAC-containing glaucoma therapies. The goal of this study was to investigate and compare Catioprost® to other glaucoma therapies in an established *in vitro* corneal wound healing model.

Methods: A wound was created by mechanically scraping through a monolayer of confluent immortalized human corneal epithelial (HCE) cells. Cytotoxicity, cell migration

and proliferation were analyzed 2h and 1, 3, 6 days after a 30min exposure to either phosphate buffered saline (PBS), 0.02%BAC+latanoprost, 0.01%BAC+tafluprost, 0.015%BAC+travoprost, 0.005%BAC+bimatoprost, Catioprost® and its emulsion vehicle. Immunostaining was performed for Ki67 and Occludin, and TUNEL was assessed to detect apoptosis.

Results: Preserved anti-glaucoma eye drops delayed corneal healing primarily related to the concentrations of their common BAC preservative (0.02%BAC+latanoprost> 0.01%BAC+tafluprost> 0.015%BAC+travoprost > 0.005%BAC+bimatoprost), especially from 1 day. The delayed healing observed with all of the BAC-containing solutions was accompanied by the loss of dividing cells (i.e. Ki67-positive cells) and an increased number of apoptotic cells. In contrast, Catioprost® favored the healing process and maintained the capacity of cells to divide. Moreover, when compared to PBS-treated cells, Catioprost® increased rate of wound closure.

Conclusions: This *in vitro* scraping model allowed us to compare the cytotoxicity and dynamic wound healing capacity of commonly prescribed IOP lowering ophthalmic preparations. We demonstrated that one application of a BAC-containing prostaglandin analogue blocked the wound healing process, and induced apoptosis in a HCE cells monolayer, whereas, BAC-free Catioprost® protected the viability of the HCE cells and accelerated the healing process. Catioprost® appears to have important advantages over existing prostaglandin analogue eye drops and should be of particular interest for the management of glaucoma patients with and without OSD.

P491 A 28-DAY ACTIVE-CONTROLLED, PHASE 2B STUDY ASSESSING THE SAFETY AND OCULAR HYPOTENSIVE EFFICACY OF AR-12286 IN PATIENTS WITH ELEVATED INTRAOCULAR PRESSURE

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Background: To evaluate the ocular hypotensive efficacy and safety of AR-12286 0.25% and 0.5% Ophthalmic Solutions in comparison to latanoprost in patients previously treated for ocular hypertension or glaucoma. AR-12286 is a selective Rho kinase inhibitor that lowers intraocular pressure (IOP) by increasing trabecular outflow.

Methods: Double-masked, active-controlled, randomized clinical trial. Subjects (n = 217) were randomly assigned to receive AR-12286 0.25% b.i.d., AR-12286 0.5% q.d. PM, or latanoprost q.d. PM for 28 days. Primary and secondary efficacy endpoints were mean IOP at each diurnal time point (8 am, 10 am, 12 pm, and 4 pm) on days 14 and 28 and mean change in IOP from diurnal baseline, respectively.

Results: Both concentrations of AR-12286 produced statistically and clinically significant reductions in mean IOP at all time points across days 14 and 28. Mean IOP ranged from 18.0 to 21.8 mmHg (-6.0 to -3.9 mmHg) for AR-12286 0.25% b.i.d., 18.0 to 20.4 mmHg (-6.1 to -2.9 mmHg) for AR-12286 0.5% q.d., and 17.5 to 19.0 mmHg (-7.0 to -4.4 mmHg) for latanoprost q.d. AR-12286 0.5% provided a superior diurnal IOP profile compared to AR-12286 0.25% due to better control of IOP at 8 am (12 hours after pm dosing). The overall difference in mean diurnal IOP between AR-12286 0.5% and latanoprost was +0.9 mmHg (p = 0.002)

in favor of latanoprost. This difference was +0.5 mmHg (p = 0.051) when responder sub-groups (mean IOP reduction > 5%) were compared. The only adverse events of note for AR-12286 0.5% were conjunctival hyperemia, which typically resolved during sleep, and mild stinging upon instillation. Two out of 140 AR-12286 patients were discontinued for hyperemia (1 -0.25%, 1 - 0.5%).

Conclusions: AR-12286 0.5% dosed q.d. PM provided better control of diurnal IOP than AR-12286 0.25% dosed b.i.d., was slightly less efficacious than latanoprost, and was well tolerated. There were no drug-related serious adverse events in the study.

P492 A TWELVE-MONTH OPEN-LABEL SAFETY STUDY OF POLYQUATERNIUM-PRESERVED DUOTRAV

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Background: DuoTrav, preserved with benzalkonium chloride (BAK), is a combination eye drop containing a topical prostaglandin analogue, travoprost 40 µg/mL, and a topical beta-adrenergic receptor blocking agent, timolol 5 mg/mL. DuoTrav is indicated for the reduction of IOP in adult patients with open-angle glaucoma or ocular hypertension who are insufficiently responsive to topical beta-blockers or prostaglandin analogues. A new formulation of DuoTrav has been developed which uses polyquaternium-1 (PQ) as the preservative. The primary objective of this clinical trial was to evaluate the long-term safety of DuoTrav (PQ-preserved) in patients with open-angle glaucoma or ocular hypertension.

Methods: One hundred fifty-four patients (18 to 85 years of age) with open-angle glaucoma or ocular hypertension were enrolled in this 12-month open-label safety study. Patients received DuoTrav (PQ-preserved) once daily at 9 AM for 12 months and returned for follow-up examinations at 6 weeks, 3 months, 6 months, 9 months, and 12 months. Safety assessments included best-corrected visual acuity, ocular signs (eyelids/conjunctiva, cornea, iris/anterior chamber, lens), pachymetry, automated perimetry, tonometry, ophthalmoscopy (vitreous, retina/macula/choroid, optic nerve, cup/disc ratio), cardiovascular parameters (pulse and blood pressure), and adverse events.

Results: No safety issues with DuoTrav (PQ-preserved) were identified based upon a review of changes from baseline for best-corrected visual acuity, ocular signs, IOP, ophthalmoscopy, corneal thickness, visual fields, and pulse and blood pressure. No serious adverse events assessed as related to the use of DuoTrav (PQ-preserved) were reported during the study. Twelve patients reported serious adverse events unrelated to the use of DuoTrav (PQ-preserved). Adverse events reported in this trial were consistent with the established safety profile of DuoTrav (BAK-preserved) or its individual components.

Conclusions: The overall safety profile of DuoTrav (PQ-preserved) administered for 12 months was consistent with the established safety profile of DuoTrav (BAK-preserved) or its individual components. Further studies are required to confirm the benefits of the BAK-free formulation on ocular surface of patients with open-angle glaucoma or ocular hypertension.

P493 TAPRENEPAG ISOPROPYL (PF-04217329) A SELECTIVE EP2 AGONIST FOR REDUCTION OF INTRA-OCULAR PRESSURE (IOP)

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Background: Taprenepag is an investigational EP2 agonist under evaluation as monotherapy and in combination with latanoprost for reduction of elevated IOP.

Methods: Safety, efficacy, and dose-response of taprenepag once-daily topical ocular solution was assessed in pre-clinical models (rabbits, dogs, non-human primates) and in 2 Phase II trials in subjects with open-angle glaucoma or ocular hypertension. In 30 subjects, serial corneal staining and pachymetry were assessed in addition to full 24-hour IOP evaluation in habitual body position.

Results: Taprenepag significantly lowered IOP and provided 24-hour control in normotensive and glaucomatous dogs and in ocular hypertensive non-human primates. Taprenepag induced dose-dependent conjunctival hyperemia in dogs and rabbits. At high doses in the primate, taprenepag induced iritis, severe conjunctival hyperemia, and increased corneal thickness. There was no specular microscopic, histological, or transmission electron microscopic evidence of toxicity to the cornea or its endothelium. The adverse events resolved with discontinuation of the medication. A total of 347 ocular hypertensive and open-angle glaucoma subjects were treated with taprenepag alone or in an unfixed combination with latanoprost 0.005% once daily for a maximum of 28 days. Taprenepag significantly lowered IOP during both day and night-time hours. IOP reduction with monotherapy was comparable to latanoprost; combination therapy produced mean diurnal IOP reduction ~ 2 mmHg greater than latanoprost alone. The taprenepag related emergent adverse events were mild to moderate conjunctival hyperemia, photophobia, corneal staining and increased corneal thickness. There was no evidence of taprenepag toxicity to the corneal endothelium, stromal keratocytes or basal cell epithelium on confocal microscopy (Nidek ConfoScan 4). Mild corneal staining and disturbance of the superficial corneal epithelium may explain the observed increase in anterior stromal reflectivity.

Conclusions: Taprenepag significantly reduces IOP and maintains control for at least 24 hours. Treatment-related adverse events were mild to moderate and resolved without sequelae. Because of its novel mechanism of action, taprenepag is additive to the IOP-reducing effect of latanoprost 0.005% and may show similar additivity to other ocular anti-hypertensive medications.

Medical Treatment: Other Drugs in Relation to Glaucoma

P494 OCULAR HYPERTENSION AFTER INTRAVITREAL APPLICATION OF TRIAMCINOLON-ACETONIDE IN THE TREATMENT OF MACULAR EDEMA

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Background: The aim of our study was to investigate frequency of ocular hypertension at the patients, who were treated with intravitreal triamcinolon-acetonide for the treatment of macular edema.

Methods: We examined 60 eyes (60 patients) with diffuse diabetic macular edema, who were not treated with laser-photocoagulation before. We applied 25 mg triamcinolon-acetonide intravitreal. We examined the results in the period of three years of: visual acuity, intraocular pressure (IOP) and biomicroscopic examination of the anterior and posterior segment of the eye.

Results: We noticed increasing of IOP (more than 22 mmHg) at 34 eyes (56.7%). The period when we noticed this increasing was about 1.55 ± 1.63 months after intravitreal application of triamcinolon-acetonide. At 33 patients (97.1%), where we noticed increased IOP, we regulated IOP of our patients with local medicament therapy. At one patient filtering surgery was necessary. Regulating of the IOP without medicament therapy was achieved 9.41 ± 2.51 months after intravitreal application of triamcinolon-acetonide.

Conclusion: We noticed significant increasing of IOP after intravitreal application of triamcinolon-acetonide, even if we got good results with reduction of macular edema and increasing of visual acuity.

P495 EFFICACY AND SAFETY OF THE FIXED COMBINATION TRAVOPROST/TIMOLOL VERSUS DORZOLAMIDE/TIMOLOL IN PATIENTS WITH OPEN-ANGLE GLAUCOMA OR OCULAR HYPERTENSION

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Background: To compare the efficacy and safety of the fixed combination travoprost 0.004%/timolol 0.5% versus fixed combination dorzolamide 2%/timolol 0.5% in patients with open-angle glaucoma or ocular hypertension.

Methods: Three-month, prospective clinical study included 60 patients with open-angle glaucoma or ocular hypertension who were randomized into 2 groups to receive fixed combination travoprost/timolol once daily in the morning and fixed combination dorzolamide/timolol twice daily. Follow-up was done at 14 and 45 days and 3 months. Intraocular pressure measurements were taken at each follow-up examination at 8 am, 10 am and 4 pm.

Results: Both fixed combination reduced intraocular pressure significantly at all follow-up and times of day ($p < 0.001$). For all visits the mean diurnal IOP was 16.13 mmHg for the travoprost/timolol group and 16.15 mmHg for dorzolamide/timolol group. The mean intraocular pressure reduction from baseline was greater for travoprost/timolol fixed group -8.96 mmHg (-7.46 mmHg to -9.92 mmHg) than for dorzolamide/timolol fixed group -8.07 mmHg (-6.93 mmHg to -8.93 mmHg) [$p = 0.196$]. The most frequent treatment related adverse events were conjunctival hyperemia in travoprost/timolol fixed group and dry eye and foreign body sensation in dorzolamide/timolol fixed group.

Conclusions: Travoprost/timolol fixed combination was slightly more effective than dorzolamide/timolol fixed combination in reducing mean diurnal intraocular pressure. Travoprost/timolol fixed combination resulted in an intraocular

pressure reduction up to 1.07 mmHg greater than dorzolamide/timolol fixed group. Both fixed combinations were well tolerated and safe.

P496 THE PROTECTIVE EFFECT OF STATINS AND COMPARISON OF SEVERITY OF GLAUCOMA AMONG PATIENTS ON STATINS AND WITHOUT STATINS IN A COMMUNITY BASED GLAUCOMA PRACTICE

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Background: Studies have shown lower prevalence of primary open-angle glaucoma and slowed progression of optic nerve head parameters in glaucoma suspects on oral statin therapy. Purpose of this study is to determine the protective effect of the oral statin therapy on the severity of glaucoma in primary open-angle glaucoma patients.

Materials and Methods: A retrospective study of 287 primary open-angle glaucoma (POAG) patients, classified by race, gender and age was conducted. POAG patients are identified by statin use (CWS, & AABS) & without statin use (CNS & AABNS). POAG was stratified by severity of nerve damage & visual field loss by GDX/OCT imaging, HVF perimetry, and CD ratios. Duration of statin use was classified as Short (1-5 yrs) medium (6-10 yrs) long (11+ yrs).

Results: 176 African Americans (AAB) and 110 Caucasians (CW) analyzed & classified as normal (N), early (E), intermediate (I) & severe (S) for each test using normative database by color coding white/green (N) blue (E) yellow (I) & red(s) on (GDX/OCT), CD ratios by 0.0-0.3 (N) 0.4-0.5 (E), 0.6-0.7 (I) & 0.8-1.0 (S) values & HVF (MD) values, +1.0-1.0 (N), -1.1-5.9 (E), -6.0-10.9 (I) & > -11 (S). The patients grouped N & E and I & S groups combined AA & W analyses of more severe eye in each patient showed less prevalence of severe glaucoma in statin group HVF $p = 0.04$ GDX/OCT $p = 0.21$ CDR $p = 0.39$ & when both eyes analyzed CW patients showed more significant protection to severity than AAB HVF $p = 0.005$ vs $p = 0.13$, GDX/OCT $p = 0.03$ vs $p = 0.82$ & CDR $p = 0.18$ vs $p = 0.9$ as to statin therapy I & S group was less frequent in CW statin group than AAB statin group.

Conclusions: This study showed in patients on statin therapy CW patients have less prevalence of I & S and higher prevalence of N & E level than AAB patients. The duration of statin use affected CW patients more positively 25% vs 33% than AAB patients.

P497 COMPARISON OF THE EFFECT OF BIMATOPROST-TIMOLOL FIXED COMBINATION AND TRAVOPROST-TIMOLOL FIXED COMBINATION ON INTRAOCULAR PRESSURE IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA OR OCULAR HYPERTENSION

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Background: Fixed combination of glaucoma medicines improves compliance and adherence to treatment. Nevertheless, the current available fixed combination of Latanoprost and Timolol was shown to be less effective than the non-fixed combination of their counterpart. Thus it was not widely prescribed. This study was designed to identify a fixed combination of Prostaglandin & Timolol to replace a non-fixed combination of Latanoprost & Timolol which are commonly

used in our setting. It has a secondary objective to increase compliance and adherence and to cut cost on glaucoma medicine expenditure. We compared the effect of fixed combination of Bimatoprost & Timolol (BTFC) and fixed combination of Travoprost & Timolol (TTFC) on intraocular pressure (IOP) in patients with primary open-angle glaucoma (POAG) or ocular hypertension (OHT) after they were switched from a non-fixed combination of Latanoprost & Timolol (LTNFC).

Methods: It was a prospective, randomized, observer-masked, crossover comparison study. 41 consecutive patients with POAG or OHT patients whose IOP were controlled (IOP ≤ 21 mmHg) on LTNFC for at least 3 months before baseline visit were randomized to either BTFC or TTFC for a 8-weeks treatment period. IOP was measured at baseline and at the end of 8-weeks for each drug at 8AM, 12PM, 4PM and 8PM. After the first treatment with either BTFC or TTFC for a period of 8 weeks, diurnal IOP measurement was performed. The patients were then switched to the opposite drug without a medication-free period. Diurnal IOP measurement was again performed at the end of the second 8-weeks treatment period. The main outcome measure was the mean IOP of the 12-hour IOP curve and mean baseline IOP at each time point (8AM, 12PM, 4PM and 8PM) at baseline, compared to BTFC and TTFC after 8-weeks of treatment. Conjunctiva hyperaemia and Superficial Punctate Keratopathy (SPK) at baseline and after 8-weeks of treatment with BTFC and TTFC were graded and analyzed.

Results: There were no statistically significant differences in IOP lowering between BTFC and TTFC at all time-points after a period of 8-weeks treatment. However, both BTFC and TTFC reduced the mean IOP from baseline (LTNFC). BTFC reduced the mean IOP at baseline significantly statistically from 17.3 mmHg (95% CI) to 16.4 mmHg ($p = 0.036$). The IOP was lower at all time-points compared to baseline and statistical significance were achieved at 4 PM and 8 PM. TTFC lowered the IOP to 17.1 mmHg but it was not statistically significant. TTFC reduced the IOP at 12 PM, 4 PM and 8 PM but showed increased level at 8 AM. Both BTFC and TTFC had no significance difference effect in terms of conjunctiva hyperemia compared to baseline. However there was significantly less SPK after 8-weeks treatment with TTFC ($p = 0.012$). Both treatments showed similar tolerability profile.

Conclusions: Both BTFC and TTFC are comparable in IOP lowering effect. BTFC had showed significant reduction of mean IOP from baseline and at 4 PM and 8 PM. Both BTFC and TTFC showed good tolerability and TTFC had demonstrated significant less effect of SPK.

P498 COMPARATIVE STUDY OF THE EFFICACY AND SAFETY OF A FIXED COMBINATION OF DORZOLAMIDE-TIMOLOL AND BRIMONIDINE-TIMOLOL IN PATIENTS WITH OPEN-ANGLE GLAUCOMA AND OCULAR HYPERTENSION

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Background: To evaluate the efficacy and safety between Fixed combination of Dorzolamide-Timolol and Brimonidine-Timolol in patients with Open-angle glaucoma (OAG) and Ocular hypertension (OH).

Methods: A prospective, multi-center, randomized, and simple blind clinic study with 3 months of follow-up in patients

with OAG and OH. Patients were randomized in two groups: Group A Dorzolamide-timolol and group B Brimonidine-timolol twice a day. Intraocular pressure (IOP) was measured at the beginning of treatment and 4, 8 and 12 weeks after. Arterial pressure, heart beat and local side effects survey were also registered. Statistical analysis was made using Student Test for non pared samples.

Results: Forty-eight patients (48 eyes), 26 in group A and 22 in group B were treated. A reduction of IOP from basal was -8.92 mmHg, -9.35 mmHg and -9.08 mmHg in group A and -7.64 mmHg, -7.82 mmHg and -8.86 mmHg in group B at 4.8 and 12 weeks respectively. These values were not statistically different. No changes were seen in arterial pressure and heart beat. Local side effects as itching and burning were more frequent in group B so as pain was in group A.

Conclusions: Both medical treatments showed the same efficacy and safety in patients with OAG and OH. Nevertheless, IOP reduction was clinically more significant in group A.

Medical Treatment: Vehicles, Delivery Systems, Pharmacokinetics, Formulation

P499 NON-CLINICAL ASSESSMENT OF THE EFFECT OF TAPRENEPAG ISOPROPYL (PF-04217329) DOSES AND FORMULATIONS ON INTRAOCULAR EXPOSURE OF THE ACTIVE METABOLITE OF TAPRENEPAG (CP-544326)

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Background: The current investigation elucidates potential effects of topical administration of taprenepag (PF-04217329) formulation strength and composition on the ocular pharmacokinetic profile of its active metabolite, CP-544326. The results help inform a minimum taprenepag (PF-04217329) dose and formulation required for achieving maximum intraocular CP-544326 exposure and/or clinical efficacy for reducing intraocular pressure (IOP).

Methods: Dutch belted pigmented rabbits (N = 70) were dosed topically with taprenepag (PF-04217329) solutions prepared in formulations A and B used in the Phase 2 clinical trials, or multiple variations of formulation B with different taprenepag (PF-04217329) and solubilizing agent concentrations resulting in different solution saturation levels. The rabbits were sacrificed at predetermined time points within 12 hours following the application of the eye drops, and the exposure levels of CP-544326 were measured in cornea, aqueous humor, and iris/ciliary body (ICB). The collected samples were analyzed using LC-MS/MS methods. All rabbit studies were conducted in accordance with the Animal Welfare Act, the Guide for the Care and Use of Laboratory Animals and the Office of Animal Welfare.

Results: In all formulations, the descending order of exposure to CP-544326 in rabbit ocular tissues was cornea > aqueous humor > ICB. Taprenepag (PF-04217329) prepared

in formulation B and its variations resulted in 2-3 fold higher bio-availability of CP-544326 in all rabbit ocular tissues compared to administration of taprenepag (PF-04217329) prepared in formulation A. Among formulation B and its variations, intraocular CP-544326 exposure was driven mainly by taprenepag (PF-04217329) concentration and was not significantly affected by the amount of solubilizing agent or degree of saturation.

Conclusions: The current investigation suggests that ocular exposure of CP-544326 appears to be influenced mainly by taprenepag (PF-04217329) concentration. Other formulation components such as osmolarity, buffering, and chelating agents and pH may have contributed to ocular CP-544326 bio-availability as well.

Medical Treatment: Cooperation with Medical Therapy, E.G., Persistency, Compliance, Adherence

P500 MULTI-CENTER STUDY OF COMPLIANCE AND VIDEO-TAPED EVALUATION OF EYE DROP INSTILLATION IN GLAUCOMA PATIENTS

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Purpose: To assess the prevalence of noncompliance and evaluate improper administration single drop onto their eye among the glaucoma patients

Methods: 120 glaucoma patients from 4 different hospitals were evaluated using a carefully prepared questionnaires. Noncompliance was defined as missing at least 1 drop of medication per week. Patients were asked to indicate the most common reason for missing medication. Instillation of one eye drop into their eye were video-recorded and analyzed.

Results: 120 patients with glaucoma participated in the study. Of these, 41 (33.1%) reported missing at least 1 drop of medication per week and 7 (5.8%) were unable to accurately describe their medication regime. Forgetfulness, unavailability of eye drops were the most cited reasons for non-adherence. With regard to drop administration 18 (15.0%) missed their eye, and 32 (26.6%) contaminated the bottle tip. Factors associated with improper administration technique were 60 years and older, but there were no association between non adherence and sex, level of education and family history of glaucoma.

Conclusion: Non-adherence to topical glaucoma medication is fairly common and patients demonstrated improper administration technique. They should be educated on the importance of compliance and instructed on proper drop administration.

P501 ADHERENCE TO MEDICATION AND CO-RELATION TO KNOWLEDGE OF GLAUCOMA AND MULTI-DIMENSIONAL HEALTH LOCUS OF CONTROL

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Background: In Glaucoma, the nature of the disorder and

lack of an immediate perceptible benefit with daily therapy might well foster non-adherence. There is no single determinant of non-adherence. Patients are the final health decision makers and their inherent beliefs about what controls and affects their health are crucial in their adherence behavior. Psychological assessment questionnaires are used to classify patients' attitude towards their illnesses. Little is known if such classification can help predict patient adherence behavior.

Aims: 1. To estimate the awareness and knowledge about glaucoma in patients diagnosed with glaucoma; 2. To determine self reported adherence/non adherence to glaucoma medications; 3. To evaluate Multidimensional Locus of Control in patients and co-relate with reported adherence to medication.

Design: Clinic based cross sectional study.

Methods: This cross sectional analysis examined 164 consecutive patients. All glaucoma patients who had been prescribed one or more topical anti-glaucoma medications at least for the past 6 months were included in the study. Self reported adherence was assessed using Morisky's self-report questionnaire. Basic knowledge about glaucoma was tested using 6 questions. The Multidimensional Locus of Control (MHLC) questionnaire measured three dimensions of locus of control of reinforcement as it pertains to health -internal, chance, and external powerful and others. The questionnaires were administered either in a glaucoma information meeting with small groups of 10-20 patients, or by face to face interviews by a single interviewer. In addition to the questionnaire based assessment of adherence, an objective assessment was attempted by collecting the medication bottles in a subset of the sample to determine the number of drops used in a specified time. The two methods of classification, namely questionnaire based, and drop counting methods of adherence were compared for agreement.

Results: 60 (36.6%) were classified as adherent, 62 (37.8%) were moderately adherent, and 42 (25.6%) were non adherent by the self-reported questionnaire. 60.6% of the non-adherers were males. Adherers did not differ significantly from non-adherers in age, education or number of glaucoma medications. Patients with other pre-existing co-morbid conditions were found to be significantly more adherent than others ($p = 0.038$). 74 (45.1%) patients had good knowledge about glaucoma, but this was not statistically significant when co-related to adherence. Of the non-adherers ($n = 104$), 43.3% had a predominantly 'chance' LOC, 34.6% had a predominantly 'Internal' LOC and 22.1% had an 'external' LOC. But none of these could predict adherence behavior. By the drop counting method, 77.3% ($N = 58$) were classified as adherent and 22.7% ($N = 17$) were found to be non-adherent. People who claimed to be adherent in the questionnaire were also likely found to be adherent by the drop counting method.

Conclusion: In a country like India, there is no scope for assessing adherence by pharmacy data or use of electronic devices. It is difficult to get a true estimate of adherence. Even an indirect estimate by counting the drops in the medication bottles could not easily pick up non-adherers. The Locus Of control has been useful in predicting adherence behavior in other systemic illnesses, however in Glaucoma; this relation could not be demonstrated.

P502 EASE OF ADMINISTRATION OF ANTI-GLAUCOMA MEDICATION: MONODOSE VERSUS MULTIDOSE VIALS

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Background: There is evidence that between 28 to 58% patients do not use their anti glaucoma medication as prescribed, with non compliance ranging from 30-40%. This is a serious limiting factor in glaucoma therapy as patients require long term care for a disease which is largely asymptomatic. The reasons for non compliance are varied, ranging from economics, lack of understanding of the nature of disease, and poor access to medication. Patient factors like forgetfulness and side effects of the medication, both ocular and systemic, are also important considerations. With an aging population demographics worldwide, the patients inability to use the medication assumes great importance. This study aims to evaluate the ease of administration of anti-glaucoma medication and correlates it to the use of monodose and multidose vials.

Methods: 65 patients on anti glaucoma therapy for a mean duration of 105.2 ± 91.2 months (range 2-360; median 120 months) were included in this questionnaire based non interventional study. A four point questionnaire with binary end points was completed by patients and evaluated subsequently. The level of statistical significance was set as $p < 0.05$.

Results: Out of the 65 patients recruited for the study, 29 were using monodose vials, while 36 used the multidose conventional bottles. The mean age of the patients enrolled in this study was 73.7 ± 8.8 years (75, range 52-93 years); with 37 males and 28 females. The age distribution in the multidose and monodose groups were not found to be statistically significant, and were 74.6 ± 9.9 years (median 75.5, range 52-93) and 72.5 ± 7.2 years (median 73, range 54-89) respectively ($p = 0.33$). 26 out of 65 (40%) were unable to put the drops themselves, and required external assistance. No patients below the age of 68 years need assistance for administration of eye drops. A significant correlation was noticed between age and difficulty of administration of eye drops ($p < 0.02$). Number of women needing assistance was found to be 13/28; as against 13/37 men, but the difference was not found to be statistically significant. The need for assistance as well as difficulty in administration were found to be to significantly dependent on the number of glaucoma medications instilled.

The difficulty in administration, as well as the need for a caregiver for administering the drops, were not correlated with gender, duration of disease or the vial used. The patients on monodoses were not found to be more likely (Mann Whitney Rank Sum Test, $p = 0.56$) to request a change in their medication depending on ease of administration, in comparison to the patient on multidoses. Patient satisfaction with the monodose vial was not found to be more than that with the multidose vial (Mann Whitney Rank Sum Test, $p = 0.560.54$).

Conclusion: As many as forty percent patients require external assistance in using their anti-glaucoma medication, and this can potentially affect compliance. This becomes increasingly relevant in an ageing population, as disease severity and the use of multiple medications becomes more frequent. Patients do not report a difference in the ease of administration using monodose or multidose vials.

P503 WHICH ONE IS MORE EFFECTIVE AND SAFE?

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Background: To compare the reducing effect of intraocular pressure (IOP) and the safety of the fixed combination (FC) of dorzolamid/timolol, FC of latanoprost/timolol, and FC of travoprost/timolol administered in POAG patients.

Methods: 60 POAG patients, where monotherapy is inadequate, were separated 3 groups. First group received once-daily morning dose of the fixed combination latanoprost and timolol. Second group received twice-daily dose of the fixed combination of the dorzolamid and timolol and last group received once-daily evening dose of the fixed combination of the travoprost and timolol for months. The IOP was measured at 08:00, 12:00, and 16:00 at baselines at the end of first month and third month. Adverse events were recorded at each visit.

Results: All 60 patients were included in observed cases analyses. Mean IOP at baseline was 27.3 mmHg in all groups. With respect to baseline, mean reductions in day time IOP at the end of 3 months were 9.5 mmHg, 9.7 mmHg and 9.7 mmHg respectively in all groups. All treatments were well-tolerated.

Conclusion: The study showed that when monotherapy is inadequate, all of the FC treatments result in significant decreases both clinically and statistically, in post-baseline IOP levels and are well tolerated.

P504 PERSISTENCE AND ADHERENCE TO GLAUCOMA THERAPY IN AUSTRALIA

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Background: A number of studies have reported poor persistence with glaucoma medications. However biases induced by the use of pharmacy databases and short study durations have raised questions concerning the accuracy of this data. This study assessed persistence with and adherence to glaucoma therapy in a highly inclusive national population over at least 4 years.

Methods: Data was drawn from Australia's universal Pharmaceutical Benefits Scheme (PBS). The dataset consists of random 1 in 10 dispensed claims in the period June 2002 to March 2010. Estimates were validated against the independently published PBS website statistics for each product. Persistence was measured using a 6 month initiation period of no therapy, 3 and 6 month cessation periods for all patients and a long term concessional cohort in the initiation window from October 2005 to September 2009. All glaucoma medications where tested using proportional hazards ratio with Latanoprost as the comparator. Persistence by patient gender, age, patient concessional status and prescriber type was also measured using both cessation rulings.

Results: During this period 17,442 patients were initiated on glaucoma medications. Using the 3 month cessation ruling, patient persistence at 6 months was 47.6%, at 12 months 39.4%, at 48 months 23.7% with a median persistence of 9 months. Using the 6 month cessation ruling patient persistence at 6 months was 55.7%, at 12 months 47.8% and at

48 months 30.2% with a median persistence of 9 months. The mean periods of therapy from initiation to censorship for both groups were 5.14 and 5.31 months respectively. Latanoprost showed significant differences in patient persistence with therapy compared to other medications.

Conclusions: Persistence with glaucoma therapy in this inclusive long term study was poor and similar to estimates in previous studies. This suggests a substantial disconnect between prescribers intentions and patient behaviour. Loss to follow-up may be a major reason for poor persistence and with glaucoma medications.

Medical Treatment: Other

P505 AN EVALUATION OF THE USEFULNESS OF A UNIOCCULAR TRIAL OF TOPICAL GLAUCOMA MEDICATION WHEN INITIATING THERAPY

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Purpose: To assess the value of a uniocular trial.

Methods: Twenty eight phakic patients with untreated open-angle glaucoma or ocular hypertension and IOP > 21 mmHg in both eyes were included. IOP was measured at 8 am, 11 am and 4 pm on one day a week for three weeks. On the third week travoprost was started in the eye with the higher IOP, on week 4 treatment was started in the second eye and measurements were made over the following 3 weeks.

Results: 28 patients recruited. 392 separate measurements at 11 am. Regression to mean demonstrated in both eyes (V0 – mean V1, V2, V3). Difference noted between adjusted and unadjusted IOP values for first eye. Significant reduction in IOP for both eyes with Travatan (true effect). First eye = 8.5 mmHg [(mean V1, V2, V3) – (mean V5, V6, V7)]. Second eye = 6.8 mmHg [(mean V1, V2, V3) – (mean V5, V6, V7)]. No significant difference between adjusted IOP and true mean effect in first eye

Discussion: The value of a uniocular trial of topical glaucoma medication in predicting a response to medication is a controversial approach to commencement of therapy and the results in the literature are inconclusive. Our study shows that a uniocular trial of topical glaucoma medication results in a measurable reduction of pressure in the treated eye which remains when adjustment for regression to the mean is made.

Conclusion: A uniocular trial is a useful clinical indicator of an individual's response to a glaucoma drop.

P506 COMPARISON OF TEAR FILM STATUS OF PATIENTS WITH GLAUCOMA AND CONTROL GROUP

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Background: To determine the condition of the tear film glaucoma patients. Compare the result with the control group. Establish a connection tests results with the subjective symptoms, the duration of glaucoma treatment and with amount of off drugs in the treatment of glaucoma therapy.

Methods: A prospective study which involved 31 respon-

dents (statistically 62), older than 40 years, divided into two groups: Glaucomatous patients. Control group. In assessing the state of the tear film were used to search: Slit lamp examination TBUT Schirmer test 1 Standardized questionnaire on subjective symptoms.

Results and Conclusion: The amount of drugs affect the condition of the tear film by TBUT. What's more drugs in the treatment to the poorer tear film. Patients in the first year of treatment had a worse state of the tear film. Duration of therapy has no effect on tear film. General therapy may have an impact on the tear film, especially therapy for cardiovascular disease.

P507 ELEVATED SYSTOLIC BLOOD PRESSURE ASSOCIATED TO THE USE OF LATANOPROST

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Background: a case of elevated blood pressure (BP) associated with the use of latanoprost.

Methods: the daughter of a patient diagnosed with primary open-angle glaucoma, and who controlled her mother's BP at home, reported an increase in both systolic (ST) and diastolic (DT) blood pressures after beginning treatment with latanoprost. We decided to stop the treatment for 6 weeks and afterwards to monitor her BP without any ocular hypotensive medication for one month (every 3 days, measuring the BP at 9 AM, 3 PM and 9 PM). After that, we prescribed latanoprost one drop per day on both eyes at 8 PM and, after 6 weeks, we monitored again her BP every 3 days – again three times a day – for one month.

Results: Saphiro-Wilk test did not reveal any violation of normality for all the variables considered. We obtained both systolic and diastolic mean pressures for each of the days registered, and then calculated the mean pressure for the entire period with and without the presence of latanoprost. Mean ST and DT at baseline were 140.24 mmHg (CI 95%: 133.03-147.46) and 69.45 mmHg (CI 95%: 67.72-71.19), respectively. Mean ST and DT under latanoprost were 159.9 mmHg (CI 95%: 150.54-167.25) and 73.97 mmHg (CI 95%: 71.49-76.45), respectively. A T test revealed a significant difference between baseline and latanoprost for ST (mean difference of 18.66 mmHg; CI 95%: 8.42-28.89). DT difference between baseline and latanoprost was statistically significant but clinically irrelevant (mean difference of 4.51 mmHg CI 95%: 1.74-7.35).

Conclusions: we report a case of significant increase in systolic blood pressure associated with the use of latanoprost. To the best of our knowledge, this effect has not been previously reported.

P508 EVALUATION OF OCULAR SURFACE DISEASE IN PATIENTS OF PRIMARY GLAUCOMA

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Background: Glaucoma patients often have undiagnosed

ocular surface disease due to use of topical anti-glaucoma medications which can impact the quality of life and adherence to therapy. We evaluated the prevalence of ocular surface disease (OSD) in glaucoma patients on chronic topical ocular hypotensive therapy.

Methods: Sixty four eyes of 64 cases with of primary glaucomas (POAG 30, PACG 34) on chronic topical therapy for more than 6 months were included. All patients underwent a detailed ocular surface evaluation (tear break-up time, Schirmer, corneal and conjunctival rose Bengal dye staining). Patients with secondary glaucoma or any other form of topical therapy were excluded.

Results: Mean age of the patients was 56.4 ± 8.2 years. A decreased Schirmer's value (< 10 mm) was seen in 54.7% of cases with 6.25% showing severe (< 5 mm) tear deficiency. Early tear break up (< 10 seconds) was found in 68.75% patients with 15.6% showing severe tear film (< 5 seconds) abnormality on TBUT. Corneal/conjunctival vital staining was seen in 51.6% cases with 2 patients having severe OSD. Mean Schirmer score was 12.43 ± 5.05 mm in eyes on 1 medication and 9.64 ± 3.58 mm in eyes on 2 medications (p = 0.02).

Conclusion: Ocular surface disease was found in more than half of the patients with primary adult glaucomas on chronic topical medical therapy. Evaluation of the tear film and ocular surface should be incorporated in the work up of glaucoma patients.

P509 COMPARISON OF THE EFFECT OF TRAVOPROST AND DORZOLAMIDUM/TIMOLOL FIXED COMBINATION ON 24-HOUR IOP IN OPEN-ANGLE GLAUCOMA

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Background: To compare the efficiency of travoprost/dorzolamidum/timolol fixed combination therapy on 24 hour IOP in open-angle glaucoma.

Methods: The study was retrospective on 22 patients with primary open-angle glaucoma. The 24 hour IOP was measured in sitting position with a Goldmann tonometer at 9:00, 12:00, 15:00 and 18:00. The 24 hour variation was measured at baseline and measured again at 3 months. The mean age of patients was 57.64 ± 8.81 years. The patients was randomly selected in two groups. the first group was treated with travoprost and the other group was treated with dorzolamidum/timolol fixed combination.

Results: IOP was lowered significantly statistic (p < 0.05%) in both groups. At baseline the mean IOP was 22.63 ± 2.68 mmHg for the group treated with travoprost and 22.67 ± 2.64 mmHg for the group treated with dorzolamidum/timolol fixed combination. The mean IOP after 3 months was 18.02 ± 1.64 mmHg (20.37% reduction rate) for the group treated with travoprost and 17.03 ± 1.33 mmHg (24.87% reduction rate) for the group treated with dorzolamidum/timolol fixed combination. The IOP was lowered significantly below the target IOP. p = 3.68 E-08 for the first group and p = 5.74 E-11 for the second group.

Conclusions: The 24 hour reduction was better in the group treated with the fixed combination than the 24 hour reduction in the group treated with travoprost even if the mean IOP at

baseline was almost the same. The fixed combination had a significantly better IOP reduction at all measurement time points.

P510 PRIMARY ADULT GLAUCOMA TREATMENT OUTCOME IN LAGOS

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Background: Primary aim of Glaucoma treatment is to lower intraocular pressure and preserve visual functions. Several evidence based studies have shown that lowering intraocular pressure (IOP) effectively slows optic nerve damage and visual field loss progression. The treatment options available for lowering IOP include medications, Laser surgery, and incisional surgery. Our study is aimed at evaluating the outcome of Primary adult Glaucoma treatment at the Eye clinic of a tertiary health institution in Lagos.

Methods: A comparative non-randomized retrospective study of consecutive adult patients diagnosed and treated for Glaucoma at Guinness Eye Centre of Lagos University Teaching Hospital, Idi-Araba Lagos from May 2007-April 2010. Chart review of the patients was done. Details of age, sex, type of glaucoma (defined by Shaffer's grading into Open and angle closure, severity of disease defined by Mean deviation on Humphrey's Visual Field Analyser and cup to disc ratio measurements, intraocular pressure (IOP), Pattern Standard deviation (PSD) on visual field (VF) and modality of treatment were extracted from the case records and analyzed. Main outcome measures were mean IOP measurements at baseline, 6, 12, 18, 24, 30 and 36 months follow-up and VF measurement of the mean PSD at baseline, 6, 12, 18 and 24 months follow-up. Data analysis was done using Statistical Package for Social Sciences Software (SPSS14). A p value of < 0.05 was accepted as indicative of statistical significance.

Results: Medical records of 300 patients were reviewed. Male constituted 58.3% (176) while female was 124 [41.3%]. 83.9% of the patient had open angle and 16.7% had angle closure. Mild disease constituted 37.2%, Moderate 24.% and Advanced 38.7%. The number of patients on medical treatment was 167 [55.7%] while only 64 (21.3%) had surgery (Trabeculectomy + 5 Fluorouracil) and 69 [23%] defaulted after first visit. At 1 year, for medical treatment, 78.5% of patients had IOP less than 21 mmHg while for surgical intervention 88% of the patients had IOP less than 21 mmHg (p = 0.04). 21.5% of patients on medical treatment had IOP greater than 21 mmHg while 12% of patients with surgical intervention had IOP greater than 21 mmHg with significant difference p < 0.05 (p = 0.04). The visual field deteriorated significantly from 3.14 dB to 4.55 dB for medical treatment compared to 5.32 dB to 5.40 dB for surgical intervention p < 0.05.

Conclusion: Surgical intervention of Trabeculectomy with adjunct 5 Fluorouracil resulted in a better treatment outcome with remarkable reduction in progression of the disease as revealed on the visual field assessment. Increase in uptake of trabeculectomy would help reduce the burden of blindness from glaucoma.

P511 FREQUENCY AND RISK FACTORS FOR OCULAR SURFACE DISEASE AMONG PATIENTS SUFFERING FROM CHRONIC OPEN-ANGLE GLAUCOMA (COAG) IN FRANCE

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Background: There is a large body of evidence from experimental and clinical studies showing that the long-term use of topical drugs for POAG may induce ocular surface changes, causing ocular discomfort, tear film instability, conjunctival inflammation, sub-conjunctival fibrosis, epithelial cell apoptosis, corneal surface impairment, and the potential risk of failure for further glaucoma surgery. The aim of this study was to describe ocular surface diseases and identify its risk factors in French patients treated for COAG.

Methods: An observational cross-sectional study describing ocular surface disease in patients treated for their COAG. Patients were recruited by ophthalmologists involved in the management of POAG. Were included in this study: 1) Patients aged 18 or older, 2) Patients presenting with OAG or OHT and treated with a topical IOP-lowering treatment. Socio-demographic features, clinical features, treatment and side effects were collected in a web-based standardized case report form. An ocular surface disease intensity score was calculated after answering 10 questions regarding ocular surface symptoms (5 questions) and ocular surface signs (5 questions) with a 4-grade scale. Patients were classified into three groups according to this total score: group A : score = [1 – 4], group B : score = [4 – 10] and group C : score = [10 – 30]. After bivariate analysis, a multinomial logistic regression was performed in order to identify risk factors for surface disease.

Results: In the overall sample of 516 included patients by 50 ophthalmologists, 49% belonged to group A (ocular surface disease intensity score 1 to 4), 30% to group B (5 to 10), and 21% to group C (11 to 30). The frequencies of the symptoms were: burning (47%), eye dryness (44%), foreign body (40%), itching (39%) and tearing (32%). The frequencies of the signs were: conjunctival hyperemia (60%), eyelid margin redness (47%), positive corneal fluorescein staining (35%) and positive conjunctival staining (28%), eyelid swelling (24%). 75% of patients had one history of change in the past, in their topical medication. According to bivariate analysis, ocular surface disease severity was positively correlated with the following factors: patient's age, time since the topical treatment was initiated, number of topical drugs, number of daily drops, number of eyedrop, changes of topical treatment in the past, intraocular pressure and severity of the POAG (as defined by the ophthalmologist). Once the multivariate analysis was performed, the following factors were still correlated with the severity of ocular surface disease: patient's age, number of topical drugs, changes of topical treatment in the past, intraocular pressure, glaucoma severity.

Conclusion: Patients treated for POAG or OHT often suffer from ocular surface diseases: the prevalence of clinical signs and symptoms vary between 24% and 60%. These high prevalence values may have consequences on the burden of the disease in terms of adherence to the medication and quality of life. Physicians should take into account ocular

surface involvement more carefully and discuss possible alternatives to reduce side effects and improve further outcome of the disease.

Surgical Treatment: General Management, Indication

P512 MANAGEMENT OF BLEBITIS IN THE UNITED KINGDOM: A SURVEY

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Aim: To investigate the current management trend in blebitis among glaucoma consultants registered with the Royal College of Ophthalmologists (London).

Method: An anonymous survey consisting of 13 questions to ascertain blebitis management was posted to the glaucoma consultants. Chi-square test was used to analyse correlation patterns among respondents' answers to the questionnaire.

Results: Out of 112 questionnaires, 68 (61%) was returned. Fifty-five percent of the consultants admit blebitis patients into hospital for treatment. Seventy-four percent obtain conjunctival swab, and 28% instil iodine on the conjunctiva as part of their treatment regime. Thirty-four percent use topical fluoroquinolone monotherapy, 28% cefuroxime and gentamicin, 18% fluoroquinolone with cefuroxime and 9% ceftazidime and vancomycin. Fluoroquinolones are the only oral antibiotics used by those who routinely prescribe oral treatment (69%). One-fifth of respondents use intravitreal antibiotic in treating blebitis patients. Eighty-two percent surveyed include topical corticosteroids as part of their treatment regime. Ninety-one percent use a topical cycloplegic. Twenty-three percent of the respondents treat blebitis as endophthalmitis even without or with only mild anterior chamber (AC) activity. Thirty-eight percent would do so if there was moderate AC activity, and 34% if there was severe AC activity including a hypopyon.

Conclusion: A wide variation exists in the management of blebitis among glaucoma consultants. A standard treatment regime does not exist at the moment. Further research is needed to ascertain effective strategies to manage this condition.

P513 OUTCOME OF TRABECULECTOMY WITH MITOMYCIN C IN PATIENTS WITH ADVANCED GLAUCOMA

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Background: The optimal management for advanced glaucoma remains uncertain. Many consider trabeculectomy a last resort due to potential surgical complications, although a recent Cochrane review suggested early surgical intervention may confer an advantage. Indeed, recent NICE guidance advocates primary surgery for patients presenting with advanced field loss. We aim to determine the medium term intraocular pressure control and visual outcomes for patients with advanced glaucoma undergoing trabeculectomy with mitomycin C

Methods: Patients with advanced glaucoma (MD > -20 dB) undergoing trabeculectomy surgery augmented with mitomycin C between 2000 and 2008 were identified. Intraocular pressure, visual acuity and visual field data were extracted from a surgical database.

Results: One hundred and four patients were eligible for inclusion. The post-trabeculectomy group mean IOP varied between 11.3 and 13.3 mmHg between 1 and 7 years. There was a reduction in the number achieving unqualified success year on year but no significant reduction in qualified success. At year 5, 85.2% had a qualified IOP < 16 mmHg and 96.3% had a qualified IOP < 21 mmHg. During follow-up the mean MD for the group and for individual patients remained stable (mean change in MD at year 5, -0.46 dB, $p = 0.56$). Twenty-eight patients experienced a significant reduction in Snellen acuity defined as loss of 2 or more lines. The only pre-operative determinant for a significant VA reduction was pre-operative MD indicating patients with more advanced preoperative visual field defects were more likely to experience reduction in VA post-operatively ($p = 0.029$).

Conclusion: Trabeculectomy is successful in controlling intraocular pressure in the short to medium term in patients with advanced glaucoma. A significant proportion may experience a decline in VA post-surgery although this is rarely related to surgical complications.

P514 THE EFFECT OF INTRACAMERAL TRIESENCE (TRIAMCINOLONE ACETONIDE INJECTABLE SUSPENSION) ON OCULAR INFLAMMATION AFTER TRABECULECTOMY, TUBE SHUNT IMPLANTATION OR COMBINED TRABECULECTOMY WITH CATARACT SURGERY

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Purpose: To evaluate efficacy and safety of intracameral Triesence™ (Triamcinolone injectable suspension) in patients undergoing trabeculectomy, tube shunt, or combined phacemulsification-trabeculectomy.

Methods: This is an interim analysis of 53 consecutive, eligible patients enrolled for a randomized clinical trial from April, 2009 to December, 2010 at Wills Eye Institute Glaucoma Service, Philadelphia. Patients underwent standard surgical technique and were randomized to receive either Triesence™ (Image 1) or balanced saline solution. They were followed on post-operative day 1 (POD1), week 1, month 1, 3, and 6. Outcome measures were visual acuity (VA), patient comfort, bleb grading using the Indiana Bleb Appearance Grading Scale (IBAGS), intraocular pressure (IOP), cataract, AC inflammation, and glaucoma medication need. AC inflammation was assessed at the slit lamp and measured with the KOWA FM, 500 laser flare meter. Complications were also recorded. Success was defined as IOP ≤ 21 mmHg and 20% IOP reduction. Failure was inability to meet above criteria, IOP < 5 mmHg, or the need for repeat glaucoma surgery. The primary outcome (IOP) was analyzed using mixed effects linear regression with fixed effects for treatment arm, time, treatment by time interaction, procedure type, and baseline IOP. A first-order autoregressive covariance structure was assumed to account for correlation among repeated measurements from the same subject. Rates of complications

and medication usage were compared using logistic regression. Generalized estimating equation methods were used to account for correlation among repeated measures.

Results: Pre-operative characteristics across arms were similar (age, race, sex, diagnosis, nerve health, cataract, IOP and VA). Mean IOP was higher in the Triesence™ arm on POD 1. No other significant differences in IOP were observed. Pain and foreign body sensation scores and flare scores were higher in the Triesence™ arm on Day 1 ($p=0.02$ and 0.05), while IBAGS H scores were lower ($p = 0.02$). No significant differences at future follow-ups were observed. There were no significant differences in VA, medication need, AC inflammation, or cataract formation. Complication rates throughout were similar, as were surgical success rates at 3 and 6 months.

Conclusions: Although intracameral steroid may add potency and ease compliance issues, intracameral Triesence™ showed no difference in AC inflammation, flare, VA, IOP, cataract formation, complication rate or comfort compared to controls. Intracameral use of Triesence™ during glaucoma surgery appears safe with similar outcomes to controls.

Surgical Treatment: Laser Iridotomy

P515 RE-ELEVATION INTRAOCULAR PRESSURE AFTER PERIPHERAL LASER IRIDOTOMY IN PATIENTS WITH CLOSED ANGLE

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Purpose: To investigate the long-term effects of maintenance of intraocular pressure (IOP) after peripheral laser iridotomy (PLI) in patients with closed angle.

Methods: We assessed patients who were received PLI, and divided them into two groups. There were 38 patients (41 eyes) with a history or ocular findings of acute angle closure attack in Group A, and 54 patients (70 eyes) who undergone preventive PLI in Group B. When the IOP was over 18 mmHg, it was thought to be re-elevated. We analyzed the effects of IOP maintenance after PLI by investigating the number of patients who have re-elevated IOP and the duration until the re-elevation.

Results: In Group A, the amount of IOP elevation than immediate IOP after PLI was 0.9, 1.7, 2.5, 2.7, 2.6 mmHg at 6, 12, 24, 36, 48 month. In Group B, it was 0.1, 0.4, 0.5, 0.4, 0.5 mmHg. In Group A, 18 eyes (51.4%) IOP re-elevated at 10.0 ± 13.2 month, and in Group B, 17 eyes (30.4%) did at 12.2 ± 10.2 month. IOP re-elevation rate was 26.8%, 40.0%, 51.4% at 6, 24, 48 month in Group A and 8.6%, 27.2%, 30.4% in Group B. There was significant statistical difference ($p = 0.02$, Log rank test).

Conclusions: We recommend close, long-term observation for patients received PLI, because there is high risk of re-elevation of IOP within one year, despite well-controlled immediate IOP after PLI. After preventive PLI, IOP was maintained under 18 mmHg for longer time than after acute angle

closure attack, so we have to consider to perform preventive PLI aggressively.

P516 IRIDOCORNEAL ANGLE EARLY MODIFICATIONS AFTER ND:YAG IRIDOTOMY. ROLE OF ANTERIOR SEGMENT OCT VISANTE®

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Background: To evaluate and quantify early anatomical modifications of iridocorneal angle induced after Nd:YAG laser iridotomy in patients affected by chronic angle closure glaucoma or narrow angle glaucoma.

Methods: 21 eyes of 15 patients, 12 female, 3 male affected by chronic angle closure glaucoma or narrow angle glaucoma. Pilocarpine 2% eye drops instilled each 15 minutes 1 hour before treatment, peripheral Nd:YAG laser iridotomy at 10 or 2 o'clock, power 4.5-5 mJoules. Acetazolamide 250 mg twice a day for three days and Netilmicine 0.3 Desametasone 0.1 four times a day during the 10 days after procedure. We estimate iridocorneal angle at 9 and 3 o'clock with Visante OCT® Zeiss (scan Anterior Segment Single) before (T0), 5 minutes (T1) and 10 days after (T2) the procedure and changes of anterior chamber depth at T0, T1 and T2.

Results: Mean iridocorneal angle amplitude and anterior chamber depth was respectively 22.6° and 1.91 mm before treatment at T0, 38.9° and 1.94 mm at T1 and 37.8° and 2.06 at T2. All eyes showed an increase of angle amplitude at T1 (p value < 0.005), despite no statistically significant modifications of anterior chamber depth (p value 0.08). The iridocorneal amplitude remained stable at T2 in 12 eyes, the remaining eyes showed a mild decrease in amplitude. All eyes maintained an increased angle amplitude at T2 comparing measurements of T0.

Conclusions: YAG laser iridotomy is a safe and fast technique to widen iridocorneal angle. The Anterior Segment OCT Visante® shows that the anatomical changes appear in a very short time after procedure despite no apparent evidence of anterior chamber deepening.

P517 AUDIT ON THE TREATMENT PATHWAY OF NARROW ANGLES/ANGLE CLOSURE GLAUCOMA AT MAYDAY HOSPITAL OVER A FOUR-YEARS PERIOD

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Aim: To assess whether Mayday eye unit is adhering to EGS guidelines for peripheral iridotomy in narrow angles/angle-closure glaucoma.

Backgrounds: Unfortunately, the literature on the natural progression of angle closure is scarce. Population based studies found that 19% of white people progressed from PACS (primary angle closure suspect) to PAC (primary angle closure) over 3 years, 22% of Asian population developed PAC in 5 years and 35% of Greenland Eskimo developed PAC over 10 years. The risk of progression of PAC to PACG (primary angle closure glaucoma) remains uncertain. However, studies from India and Mongolia did confirm the therapeutic effect of laser PI on patients with PAC. Therefore EGS and Mayday guidelines recommend that if the angle is deemed as narrow, then treatment in the first instance should be prophylactic iridotomy rather than a wait and see policy. All patients attending glaucoma clinics should have gonios-

copy. Narrow angle on gonioscopy should be confirmed by either a senior member or the consultant. Information leaflet should be given at the time of listing. Prophylactic laser iridotomy should be performed within 12 weeks and therapeutic iridotomy in PACG should be performed within 24 hours. On the day of laser, informed consent should be obtained, acuity should be recorded and Pilocarpine 2% should be applied. Laser sticker and surgeon name should be included in the notes. Post procedure IOP is measured and lolidine 1% to be applied. Maxidex should be prescribed for a week to be taken q.d.s. Follow up appointment for gonioscopy, dilated and undilated IOP measurement, acuity, visual field, pachymetry, and disc photos should be given within 6-12 weeks. Then if IOP remains elevated, further laser either ALPI or more PI will be applied. Further decision for removal of cataract or addition of drops will be made accordingly. Further visits will be arranged as necessary or the patients will be discharged to optometrist.

Methods: Ophthalmology notes of patients with prophylactic/therapeutic PI were reviewed retrospectively. Demographic and PI data were all recorded.

Results: Before PI: Male: 41% female: 59%, mean age: 68, narrow angle: 58%, angle closure glaucoma: 42%, documentation of advice leaflet given: 82%, acuity: 100%, Gonioscopy: 100%, IOP measurement: 100%, senior member seen: 100%, date of laser within 24 hrs/3 months: 100%. Day of laser: Consent obtained: 100%, IOP measurement: 94%, check of acuity: 100%, sticker in the notes: 100%, surgeon name: 89%, documentation of difficulties/complications: 76%, post procedure lolidine: 100%, Maxidex for 1 week: 95%. Follow up: 6-12 weeks follow up: 91%, acuity: 100%, gonioscopy: 94%, dilated and undilated IOP measurement: 82%, visual fields: 86%, pachymetry: 75%, optic disc photo: 87%, further follow up within 6-12 weeks: 100%, letter to GP: 83%

Conclusion: EGS guidelines for peripheral iridotomy in narrow angle/angle closure glaucoma are almost observed at Mayday eye unit. It was noted that short term members were more likely to miss any part of the recommended pathway rather than members with permanent job in the unit. Therefore, providing the newly appointed doctors with the guidelines will be a great step towards improvement of our performance.

P518 ONE-YEAR FOLLOW-UP AFTER LASER PERIPHERAL IRIDOTOMY FOR PRIMARY ANGLE CLOSURE USING ULTRASOUND BIOMICROSCOPY

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Background: Laser peripheral iridotomy (LPI) is considered as a prophylactic treatment for primary angle closure glaucoma (PACG) in patients with occludable angles. The purpose of the present study was to evaluate with ultrasound biomicroscopy (UBM) iridocorneal angle changes one year after LPI for narrow angles.

Methods: Forty eyes of 40 consecutive patients who were diagnosed as primary angle closure were evaluated before and after LPI. Ultrasound biomicroscopy was used to evaluate the morphology of the iridocorneal angle. The angle opening distance at 500 µm from the scleral spur (AOD 500),

trabecular-ciliary process distance (TCPD) and peripheral iris thickness (IT) were measured in the superior, inferior, nasal and temporal quadrants before LPI and after LPI at 1 month and 1 year.

Results: There were 29 women and 11 men with a mean age of 57.2 ± 13.9 years. Before LPI, the mean AOD 500, TCPD and IT were 0.09 ± 0.07 mm, 0.67 ± 0.3 mm and 0.34 ± 0.09 mm, respectively. One month after LPI the mean AOD 500, TCPD and IT were 0.14 ± 0.08 mm, 0.69 ± 0.35 mm and 0.35 ± 0.09 mm, respectively. One year after LPI the mean AOD 500, TCPD and IT were 0.13 ± 0.07 mm, 0.68 ± 0.3 mm and 0.35 ± 0.1 mm, respectively. The mean AOD 500 was statistically increased at 1 month and 1 year ($p < 0.05$). The TCPD and IT did not change significantly at 1 month and 1 year.

Conclusions: In this study, a significant and persistent angle widening was observed after LPI. However, LPI may be less effective in eyes with iridotrabecular contact, plateau iris configuration and thick iris.

P519 RESULT OF LASER PERIPHERAL IRIDOTOMY IN INDONESIAN EYES WITH ACUTE PRIMARY ANGLE CLOSURE

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Background: Acute primary angle-closure (APAC) is a disease caused by the closure of all trabecular meshwork by the iris root which will cause a sudden increase intraocular pressure (IOP). Persistent high IOP will damage the retinal ganglion cells through necrosis-apoptosis of retinal ganglion cells that is leading to optic nerve atrophy. The disease is responsible for most bilateral glaucoma-related permanent blindness. The incidence rate of APAC in Asian was 0.31-1.64% higher per year than in Caucasian. The appropriate management of this disease is extremely important and blindness in affected eye can be prevented. Long term reduction of IOP by laser peripheral iridotomy have been reported. This intervention showed satisfactory results in the Caucasian race, but not in Asian race due to more severe inflammatory reaction and the easier formation of peripheral anterior synechiae (PAS) in Asian eyes. Paracentesis for early management of APAC, as reported by Lam showed satisfactory result. However, the definitive treatment is still to do peripheral iridectomy to eliminate pupillary block mechanism. We are lacking data of successful response to laser peripheral iridotomy (LPI) in Indonesian eye with APAC and factors that is influencing its success.

Purpose: To evaluate the response of laser peripheral iridotomy and any risk factors affecting its success rate in Indonesian eyes with acute primary angle closure (APAC).

Method: This was a prospective observational study of APAC eye in Indonesian subject. All APAC eyes underwent paracentesis to reduce IOP immediately, followed by laser peripheral iridotomy. Comprehensive eye examination was done; including the extent of peripheral anterior synechiae. Risk factors assessed were age, duration of acute symptoms, the presenting IOP, IOP response to paracentesis, IOP response to laser peripheral iridotomy, anterior chamber depth and the extent of peripheral anterior synechiae.

Result: Total of 45 APAC eyes were recruited with mean presenting IOP was 56.4 ± 13 mmHg and 38 of affected eyes

were female patients. Range duration of symptoms was 2 to 30 days, only 19 eyes suffered less than 7 days. The mean of PAS extent was 7.15 ± 3.94 . After paracentesis was done in day one, IOP decreased into 49%. The success of LPI was seen in 47% eyes in two weeks. Variables that influence LPI success rate mostly depend on IOP response to the severity of PAS extent.

Conclusion: The success rate of laser peripheral iridotomy was found in 47% APAC eyes and the extent of PAS in clock hour constituted the main risk factors affecting its results.

SURGICAL TREATMENT: LASER IRIDOPLASTY

P520 MID-TERM SUCCESS OF ARGON LASER PERIPHERAL IRIDOPLASTY IN THE MANAGEMENT OF PLATEAU IRIS SYNDROME: TWO YEARS FOLLOW-UP OF 79 CASES

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Background: Iridoplasty is mainly used in cases of persistent appositional closure after iridotomy. The most common cause of persistent angle closure after iridotomy is plateau iris configuration. Only few small series reporting the efficacy of argon laser iridoplasty in plateau iris syndrome have already been published.

Methods: Diagnosis of plateau iris syndrome consisted in indentation gonioscopy after laser peripheral iridotomy followed by UBM confirmation. Inclusion criteria were an uncontrolled IOP with glaucoma medications with a narrow angle on indentation gonioscopy (trabecular meshwork hidden before indentation) with a patent peripheral iridotomy without peripheral anterior synechiae. Patients with acute angle closure and/or pseudo plateau iris (ie multiple ciliary body cysts) were excluded. 79 eyes of 40 patients were included and treated. Mean age was 56.3 ± 9.8 years, 75% of patients were female. Laser procedure was performed by the same operator with an Argon laser using long duration impacts 0.4 to 0.5 sec, 200 μ and 250 to 400 mW. 72 eyes were treated for 360°. 7 eyes were treated for only 180° because the angle was not open enough. 2 eyes were treated twice.

Results: Mean IOP before treatment was 24 ± 4.8 mmHg. Mean IOP after iridoplasty was 12.8 ± 0.9 mmHg at 6 months; 13.3 ± 1.8 mmHg at 12 months and 13.3 ± 1.9 mmHg at 24 months ($p < 0.05$ at any time). Number of glaucoma medications statistically decreased after laser from 1.7 ± 0.8 before to 1.0 ± 0.6 after procedure ($p = 0.001$). We reported few complications including inflammation (4 cases), relative mydriasis (4 cases), Urretz Zavalía syndrome (1 case). 13 eyes had selective laser trabeculoplasty after the procedure to control the IOP, 6 eyes needed a trabeculectomy and 4 had a combined procedure (cataract and trabeculectomy) during a mean follow up of 12.7 ± 16.4 months post-iridoplasty.

Conclusion: Iridoplasty is a successful technique to relieve appositional closure due to plateau iris and to control the IOP at 2 years. Indentation gonioscopy is crucial for the decision to perform the procedure.

Surgical Treatment: Laser Trabeculoplasty and Other Laser Treatment of the Angle

P521 THREE-YEAR RESULTS OF SELECTIVE LASER TRABECULOPLASTY IN EGYPTIAN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Background: Selective laser trabeculoplasty (SLT) is a technique that targets the pigmented trabecular meshwork. Studies showed SLT to be effective and safe in lowering intraocular pressure (IOP) in glaucoma patients. The aim of this study is to assess IOP drop in Egyptian patients using SLT as a primary or adjunctive mode of treatment for open-angle glaucoma (OAG).

Methods: 150 eyes with POAG were enrolled in this prospective study, they included group 1: recently diagnosed cases with no preoperative medications, and group 2: known glaucoma patients using treatment. All patients underwent 360° SLT. Patients were followed up for 36 months, changes in IOP, number of medications and complications were noted.

Results: A significant drop of IOP was found in the whole population of the study from $19.55 (\pm 4.8)$ mmHg to $16.03 (\pm 2.8)$ mmHg at 36 months of follow up ($p < 0.001$). Each subgroup had a significant drop of IOP. Mean number of medications dropped in group 2 from $2.25 (\pm 0.97)$ to $1.0 (\pm 1.3)$ at 36 months follow up ($p = 0.004$). No serious complications were encountered in our patients.

Conclusion: SLT can be safely and effectively used as a primary or adjunctive modality of treatment of glaucoma among Egyptian glaucoma cases.

P522 270° SELECTIVE LASER TRABECULOPLASTY OR MEDICAL TREATMENT IN PRIMARY OPEN-ANGLE GLAUCOMA

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Background: Controversy 201: Selective laser trabeculoplasty (SLT) or medical treatment in primary open-angle glaucoma (POAG)?

Methods: 270° SLT (1 mJ, 80 spots, 400 μ m) has been introduced into the clinical practice (732 eyes)

Results: In the first group of 569 eyes with POAG followed up retrospectively at the control visit 1 year after the SLT, it was in 357 eyes possible to decrease the medication from combined therapy to monotherapy or to decrease the frequency of the application of anti-glaucomatics, or to decrease their concentration. In other 197 eyes, the IOP was stabilized established, but it was not possible to change the therapy, and in 15 eyes trabeculectomy was necessary. In the second group of POAG (133 eyes) followed up prospectively 1, 3, 6 and 12 months after SLT, the decrease of IOP from 21.1 ± 4.5 mmHg to 17.8 ± 3.2 mmHg after 1 month ($p < 0.0001$), 18.6 ± 3.6 mmHg after 3 months, 17.8 ± 3.1 mmHg after 6

months, resp. 17.7 ± 2.8 mmHg after 12 months was established.

Conclusion: 270° SLT was found to be an efficacious method in the treatment of POAG. SLT is comparable to medical treatment as the initial therapy of POAG. If glaucoma is newly diagnosed, we leave the decision up to the patients as to whether they wish to undergo SLT or whether they would prefer drug treatment.

P523 STEROIDS AFTER LASER TRABECULOPLASTY: SALT TRIAL DESIGN AND RECRUITMENT

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Background: Selective laser trabeculoplasty (SLT) is a frequently employed glaucoma therapy that is relatively safe and effective in lowering intraocular pressures. Although the exact mechanism of SLT's effect is unknown, pro-inflammatory signaling pathways have been invoked. It is not known, however, whether typical, short-course, post-laser use of topical anti-inflammatory medicines inhibits SLT efficacy.

Methods: Randomized, double-masked, placebo-controlled, single-center, multi-surgeon trial.

Results: Patients aged over 18 years and diagnosed with open-angle glaucoma including pseudoexfoliation glaucoma and pigmentary glaucoma, a current pressure > 18 mmHg, and a historical pressure > 21 mmHg, were eligible for recruitment. Exclusion criteria included previous incisional or ablative glaucoma surgery, including previous ALT, SLT, iridoplasty or peripheral iridotomy; history of uveitis or steroid-induced ocular hypertension in either eye; or current use of systemic or ocular steroids. Following a standard administration of SLT, patients were randomized to a 5-day course of prednisolone 1%, diclofenac 0.1%, or saline control, 4 times/day. Study data for the first 50 patients will be unmasked and presented.

Conclusions: Postoperative treatment following SLT may be affected by choice of topical therapy.

P524 TRAINING ON PIXEYE SIMULATOR ENHANCES THE PERFECTION OF LASER TRABECULOPLASTY IN MEDICAL STUDENTS OF KING FAISAL UNIVERSITY, SAUDI ARABIA

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Background: To improve the safety of patients facing laser treatment by beginners, training on virtual simulators is tried before actual patient treatment

Methods: The students of the 5th year from the faculty of medicine, King Faisal University, Saudi Arabia were enrolled in this study. The students were randomized to virtual training on PixEye simulator (group A) or a control group that would receive no such training (group B). Then after completion of the training, the two groups were allowed to do the procedure comparing group A to group B. The training was preceded by power point presentation describing the details of laser trabeculoplasty. Evaluation of the procedure includes: missing the exact location of laser burns, overtreatment and under treatment and accidental laser shots to iris and cornea.

Results: 47 students were enrolled in this study, 24 in group A and 23 in group B. The exact location of laser burns was

missed in 8% in group A compared to 55% in group B. Over-treatment and undertreatment was found in 7% of group A compared to 46% in group B. Accidental corneal or iris burns were found in 4.5% of group A compared to 34% of group B

Conclusion: Training on PixEye simulator enhances the perfection of laser trabeculoplasty.

P525 THE EFFICACY OF SELECTIVE LASER TRABECULOPLASTY VS ARGON LASER TRABECULOPLASTY IN PSEUDOPHAKIC GLAUCOMA PATIENTS

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Background and Objective: This study evaluated and compared the efficacy of selective laser trabeculoplasty (SLT) and argon laser trabeculoplasty (ALT) in terms of intraocular pressure (IOP)-lowering effects in pseudophakic patients at various time points after treatment.

Materials and Methods: Fifty-two eyes of 52 glaucoma patients with uncontrolled IOP who underwent successful phacoemulsification-assisted cataract excision surgery with intracapsular lens implantation were randomly assigned to be treated with either ALT (N = 30) or SLT (N = 22). IOP measurements were carried out at scheduled intervals until 12 months post-laser treatment.

Results: Forty-seven of the 52 enrollees (90%) were followed-up for 3 months, and thirty nine (75%) were followed-up for 12 months. There was a statistically significant difference ($p = 0.011$) in the IOP decrease between the ALT and SLT groups (2.55 mmHg vs. 4.26 mmHg, respectively) at 3 months but not at 6 or 12 months (3.73 Hg and 4.30 mmHg, respectively, $p = 0.33$) post treatment.

Conclusions: SLT is more effective than ALT in lowering IOP in new pseudophakic patients in the first 3 months after treatment. There is no significant difference in their IOP lowering capabilities thereafter. Both laser procedures are safe and effective for treating various types of glaucoma.

P526 COMPARISON OF SELECTIVE LASER TRABECULOPLASTY IN PHAKIC AND PSEUDOPHAKIC EYES

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Background: The aim of this study is to compare the efficacy of selective laser trabeculoplasty (SLT) in phakic and pseudophakic eyes for the control of intraocular pressure (IOP) in open-angle glaucoma.

Methods: SLT using 532 nm Nd YAG laser was performed in 27 pseudophakic eyes and 140 phakic eyes. All eyes underwent 360 degrees SLT. Patients were examined at 1, 3, 6, 9 and 12 months. Results of phakic and pseudophakic eyes were statistically compared.

Results: Mean baseline IOP was 22.4 ± 5.2 mmHg in the pseudophakic eyes and 22.6 ± 4.6 mmHg in the phakic eyes ($p > 0.05$). Mean post-SLT IOP values at 1, 3, 6, 9 and 12 months were 17.4, 16.4, 16.3, 16.2 and 17.0 mmHg in the pseudophakic group. The respective values were 17.5, 16.7, 16.8, 16.6 and 17.3 mmHg in the phakic group. The mean reduction of IOP at 1, 3, 6, 9 and 12 months were 4.9, 6.0, 5.4, 4.5 and 5.2 mmHg in the pseudophakic group. The respective values for the phakic group were as follows: 5.1, 5.8, 6.0, 6.3 and 5.2 mmHg. The mean reduction of IOP at

post-SLT 1, 3, 6, 9 and 12 month visits were 21%, 26%, 24%, 20% and 23% in the pseudophakic group. The mean reduction of IOP at the same periods were 22%, 25%, 25%, 26% and 22% in the phakic group, respectively. There were no statistically significant differences between phakic and pseudophakic groups at all post-SLT visits ($p > 0.05$). Post-SLT IOP spikes were similar in both groups. There were no differences between the phakic and pseudophakic eyes with respect to post-SLT anterior chamber reaction.

Conclusions: SLT resulted in similar efficacy in pseudophakic and phakic eyes. SLT seems to be an efficient and safe treatment option for the management of pseudophakic glaucoma.

P527 REPEAT SELECTIVE LASER TRABECULOPLASTY IN GLAUCOMA PATIENTS WITH PRIOR SUCCESSFUL SLT

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Purpose: To evaluate the efficacy of repeat 360-degree selective laser trabeculoplasty (SLT) in Glaucoma patients with prior successful 360-degree SLT.

Methods: Forty eyes of 20 patients more than 24 years of age, with open-angle glaucoma (primary open-angle, pseudoexfoliation, pigmentary or pseudophakic glaucoma), uncontrolled on anti-glaucoma therapy or poor compliance with drops, underwent an initial 360-degree SLT (SLT1), which was successful in IOP control for 6 month, but efficacy decreased with time. These patients followed by a repeat 360-degree SLT (SLT2). Intraocular pressures (IOP) were recorded before each procedure and 1 week, 1 month, 3 month and 6 month post laser treatment.

Results: IOP was significantly less in both SLT 1 and SLT 2 with more than 20 % IOP reduction. No significant difference in IOP reduction between SLT 1 and SLT 2. The IOP reduction was more significant 1 month after laser session. Mild anterior uveitis was documented in 10% of cases.

Conclusion: 360-degree SLT is safe and effective procedure in glaucoma patients after initial successful 360-degree SLT has failed.

P528 SELECTIVE LASER TRABECULOPLASTY IN UNCONTROLLED PSEUDOEXFOLIATION GLAUCOMA, A PROSPECTIVE STUDY

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Objective: To examine the efficacy and safety of selective laser trabeculoplasty in uncontrolled pseudoexfoliation glaucoma, (PEXG)

Methods: 57 eyes of 57 patients with uncontrolled PEXG (Intra-ocular pressure [IOP] > 23 mmHg on 2 consecutive measurements) underwent selective laser trabeculoplasty. All patients had a complete ophthalmic evaluation before and at intervals after treatment, which included visual acuity, slit lamp examination, ophthalmoscopy, gonioscopy, and visual field analysis. IOP was measured 1 hour, 1 day, 1 week, and 1, 3, 6, 12, months and at last follow up postoperatively. During the follow-up period, patients were treated with topical anti-glaucoma medications as required.

Results: 12 months following SLT, IOP (mean \pm SD)

decreased by 7.5 ± 3.5 mmHg (31.5%) from 26.01 ± 2.5 mmHg to 17.8 ± 2.8 mmHg ($p < .001$). The mean number of medications per patient decreased from 2.8 to 2.3 medications. Visual acuity, visual fields, and gonioscopic findings remained unchanged. Complications included conjunctival redness and injection within 1 day postoperatively in 30 eyes (67%). One hour after SLT, an increase in IOP of more than 5 mmHg was detected in 2 eyes (3.5%), all resolved within 24 with topical medication.

Conclusion: Selective laser trabeculoplasty is safe and effective in the treatment of patients with Pseudo Exfoliation glaucoma.

P529 EFFECT OF SELECTIVE LASER TRABECULOPLASTY (SLT) ON OCULAR HEMODYNAMICS IN GLAUCOMA

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Background: SLT is known to reduce intraocular pressure effectively. Aim of the present study, however, was to evaluate the effect of SLT on ocular hemodynamics.

Methods: 151 patients (age 66.9 ± 11.9 years) with mostly advanced glaucoma underwent SLT (Solo™ SLT, Ellex Inc., 360°, 100 spots) for further IOP-reduction. 74 patients had SLT on both eyes, 31 just on their right eyes and 46 on their left eyes (105 right eyes, 120 left eyes). Ocular blood flow was assessed with the Blood Flow Analyzer (Paradigm Medical industries, Inc.) prior and 3 month after SLT. For statistical analysis a t-test analysis was applied.

Results: Approximately 64% (63 right eyes, 82 left eyes) showed an IOP-reduction after SLT. Intraocular pressure was significantly reduced in these right eyes from 17.13 ± 5.31 mmHg to 11.96 ± 3.43 mmHg (30.2%, $p = 0.0001$) and from 16.63 ± 4.86 mmHg to 12.56 ± 4.16 mmHg (24.5%, $p = 0.0001$) in these left eyes. Ocular pulse amplitude did not change significantly. Pulse volume however increased from 6.04 to 8.10 (34%, $p = 0.0001$) in right eyes and from 6.04 to 7.29 (20.7%, $p = 0.0001$) in left eyes. Ocular blood flow (microliters/sec) increased statistically significantly from 16.54 to 21.87 (32.2%, $p = 0.0001$) in right eyes and from 16.67 to 20.86 (25.3%, $p = 0.0001$) in left eyes. Ocular blood flow changes were statistically significantly correlated with a reduction of IOP (Pearson correlation coefficient $r = -0.49$; $p = 0.005$)

Conclusions: SLT does probably not change the biomechanical properties of the eye like surgery, i.e. trabeculectomy. Nor does SLT produce any pharmacological effects. Therefore an increase in ocular blood flow after SLT seems only be due to the reduction of intraocular pressure.

P530 THE HYPOTENSIVE EFFECT OF SELECTIVE LASER TRABECULOPLASTY DEPENDING ON ANGLE PIGMENTATION AND PERIPHERAL IRIS CONFIGURATION IN POAG PATIENTS

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Background: Selective Laser Trabeculoplasty is a therapeutic method used for IOP lowering in a different types of open-

angle glaucoma patients. It utilizes Nd:YAG 2nd harmonic laser impacts operating on trabecular meshwork pigmented cells without causing the coagulation effect. The aim of this study was to evaluate the hypotensive effectivity of SLT 6 weeks after the procedure was performed, depending on iridocorneal angle pigmentation and peripheral iris configuration.

Material and Methods: 63 eyes of 53 subjects (27 males, 26 females, aged 34-65 y.o., mean 50,1) with primary open-angle glaucoma on prostaglandine monotherapy was included in this prospective, non-randomized clinical study. SLT was performed with Q-switched Nd:YAG laser, on 270 degrees, 100-120 impacts of 0.5-1.1 mJ energy. IOP measurement was performed 6 weeks after the laser procedure.

Results: Mean IOP before the SLT was 15,67 mmHg (SD = 3.51), ranged 8 to 22 mmHg. After 6 weeks mean IOP decrease was 2.63 mmHg (16.5%, $p < 0.001$, SD = 2.85). The IOP lowering effect was significantly correlated with angle pigmentation ($p = 0.047$). In a 3 subgroups: low-pigmented, medium-pigmented and high-pigmented angles, the IOP reduction was respectively: 2.06 mmHg (13.7%, SD = 3.88), 2.46 mmHg (15.3% SD = 2.27), i 4.75 mmHg (29.6% SD = 2.25). No correlation between peripheral iris configuration and IOP reduction was found.

Conclusion: Selective Laser Trabeculoplasty is an effective IOP lowering therapeutic method in open-angle glaucoma patients. The relevant clinical success in glaucoma therapy – at least 20% intraocular pressure reduction – was gained only in a subgroup of OAG patients with high-pigmented angles. In other subgroups, SLT was also lowering the IOP but not to the extent to be considered as the single therapeutic procedure. The iris configuration was not a factor influencing the final results of the procedure.

P531 EFFICACY AND RESULTS OF THE SELECTIVE LASER TRABECULOPLASTY (SLT) FOR THE OPEN-ANGLE GLAUCOMA (OAG) OVER A SEVEN-AND-A-HALF-YEAR PERIOD

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Purpose: To examine safety, efficacy and tonometric outcomes of SLT procedure for patients with OAG. Reducing the IOP values of 20% is our goal.

Methods: We collected the results at 1 week, 1, 3, 6, 12 months and then, every 6 months up to 90 months postoperatively. We treated, with SLT procedure onto the 180° inferior trabecular meshwork, 118 eyes affected by known OAG, 99% of which. Primary: 65 did not change their previous therapy after SLT and 53 reduced their drops. 12 eyes had new diagnosis of OAG or OHT: SLT was the first line of treatment for them. Statistical analysis is performed through t-Student test for paired data. Moreover, visual fields were collected yearly, and OCT analysis of the papilla every two years

Results: After 90 months, 54 eyes out of 118 survived; 52 eyes were excluded for post-SLT surgery, 2 excluded for changed therapy for visual field deterioration but valid IOP, 10 were lost during follow-up. Their pre-operative IOP was 19.2 (SD: 3.2) mmHg (range 22-32). From the baseline IOP value, the IOP average obtained is 14.68 mmHg: -23.55% ($p < 0.001$). Regarding the single groups: the IOP average was 14.31 (SD: 2.11) mmHg for the eyes maintaining the same

therapy, 13 eyes maintained the success criteria at any single follow-up time visit, 14 eyes were considered 'non responders' not achieving an IOP reduction of 20% or more at least in 3 months time, 8 eyes were considered 'slow responders' obtaining the success criteria only in 3 months time but not before. The IOP average was 15.62 (SD: 2.56) for those changing their medical treatments, 4 eyes maintained the success criteria at any single follow up time visit, 13 eyes were considered 'non responders', 6 eyes were considered 'slow responders'. The 12 eyes with recent diagnosis started from an IOP average of 24.16 (SD: 3.9) mmHg, dropping to 13.93 (SD: 2.21) mmHg ($p = NA$), 5 of them were excluded for post laser cataract procedure.

Conclusions: SLT proved to be a safe, non-invasive procedure with longstanding effect, in replacement of or in addition to medical therapies. As first-line treatment, it seems to be more effective than in eyes medically treated previously.

P532 SLT AS AN ADJUNCTIVE TREATMENT. TWENTY-FOUR-MONTHS RESULTS

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Background: The objective of this study was to evaluate the efficacy of selective laser trabeculoplasty (SLT) on IOP and whether it is possible to reduce the local medication after treatment in glaucoma patients.

Methods: Our study group included 83 eyes of 43 patients, who underwent selective laser trabeculoplasty, including patients with POAG, PEX glaucoma and pigmentary glaucoma. The patients had been treated on average by 2.1 medications before SLT. The average IOP measured in the morning hours by Goldmann applanation tonometry before treatment was 20.1 mmHg. All the patients underwent SLT treatment in an extent of 180° and the total energy used was 44 – 144 mJ. Intraocular pressure was examined every 3-6 months for up to 24 months. Treatment success was defined as $\geq 20\%$ intraocular pressure (IOP) reduction.

Results: The average decrease in IOP observed was 2.36 mmHg 3 months, 1.96 mmHg 6 months, 2.57 mmHg 12 months, 2.82 mmHg 18 months and 3.2 mmHg 24 months after the treatment. The number of drugs used in local therapy decreased by 0.5.

Conclusions: SLT has proven as a valid and efficient method in lowering IOP, but we expected a greater effect on reducing the need of local medication.

P533 EFFECTIVENESS OF ADJUNCTIVE TREATMENT WITH SELECTIVE LASER TRABECULOPLASTY IS EQUIVALENT TO THAT OF PRIMARY TREATMENT REGARDLESS OF THE NUMBER OF OCULAR HYPOTENSIVE MEDICATIONS

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Background: To compare the intraocular pressure (IOP) lowering effect of Selective Laser Trabeculoplasty (SLT) when used as a primary treatment compared to its IOP low-

ering effect when used as a secondary treatment for patients with primary open-angle glaucoma (POAG) and ocular hypertension (OHT).

Methods: A retrospective chart review of consecutive patients, who underwent SLT, between May 2004 and May 2006, and completed 4 year follow-up was performed. Student's t-test was performed to compare the mean percentage of IOP reduction following SLT between the primary and secondary SLT treatment groups. Partial correlation analysis was performed to correlate the number of glaucoma medications at the time of doing SLT, to the percentage of IOP reduction following SLT at 3, 6, 12, 18, 30 and 48 months after SLT. Patients were excluded if they required additional glaucoma medications, laser, or ocular surgery during the 4-year follow up period.

Results: One hundred six eyes of 78 patients were identified. Forty two eyes of thirty patients were excluded (16 in the primary SLT group and 26 in the secondary SLT group, $p > 0.05$) due to addition of glaucoma medications. Sixty-one eyes of 48 patients were included; 22 underwent primary SLT and 39 underwent secondary SLT. The number of glaucoma medications in the secondary glaucoma group ranged between 1-3 drops (mean 1.4, SD 0.59). The mean percentage of IOP reduction following primary SLT was (19.9, SD 12.3) at 3 month, (17.9, SD 10) at 12 month, (18.1, SD 11.2) at 30 months and (14.1, SD 13.5) at 48 months. In the secondary SLT group, the mean percentage of IOP reduction was (16.8, SD 16.8) at 3 month, (18.1, SD 15.8) at 12 month, (16.8, SD 20.2) at 30 months and (15.1, SD 21.5) at 48 months. The percentage of IOP reduction was not significantly different between the primary and secondary SLT treatment groups ($p > 0.05$). Partial correlation (controlled for baseline IOP) r value between the number of glaucoma medications at time of performing SLT, and percentage of IOP reduction following SLT at 3 months was 0.7 ($p = 0.06$), at 12 months was 0.18 ($p = 0.6$), at 48 months was -1.6 ($p = 0.7$).

Conclusions: In patients with primary open-angle glaucoma and ocular hypertension who did not require the addition of glaucoma medications during the 4-year follow up period, Selective Laser Trabeculoplasty was equally effective as a primary treatment as well as a secondary treatment. SLT should still be considered as a treatment option even if the patient is on multiple glaucoma medications.

P535 RE-TREATMENT WITH SELECTIVE LASER TRABECULOPLASTY: ONE-YEAR FOLLOW-UP

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Background: Laser Trabeculoplasty has limited long-term efficacy. Selective Laser Trabeculoplasty (SLT) employs a wavelength which is specifically absorbed by trabecular pigment, allowing the use of low energy levels to produce the desired effect. Given its superior safety profile, repetition of treatment with SLT has been increasingly considered. The aim of this study was to investigate the efficacy of re-treatment with SLT and to compare this with first treatment results in the same group of patients.

Methods: Prospective, non randomized clinical trial. Eighteen patients (20 eyes) with uncontrolled mild to moderate

open-angle glaucoma previously treated with 360° SLT were retreated with this method. Laser spots were placed over 360°, 25 spots per quadrant, 74 mJ average total energy per eye. After SLT, patients maintained the same drug regimen as prior to treatment.

Results: Eighty percent of patients had an Intraocular Pressure (IOP) reduction of at least 3 mmHg at 3 months after repeat treatment (average reduction from 22.0 ± 2.2 mmHg to 16.7 ± 2.9 mmHg). At 1 year of follow-up, mean IOP reduction was 4.6 mmHg (25.5%, $p < 0.001$). No statistically significant difference was found between efficacy of both first and second treatments at 3 months and 1 year post-treatment.

Conclusions: Re-treatment with SLT appears to be an effective method to reduce IOP. Repeat SLT also seems to be as effective as inaugural treatment.

P536 COMPARISON OF 180° AND 360° SELECTIVE LASER TRABECULOPLASTY

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Background: To compare the effect and safety of two regimens of SLT, ie, SLT with 50 laser spots on 180° of trabecular meshwork and SLT with 100 laser spots on 360° of trabecular meshwork in patients with primary open-angle glaucoma and ocular hypertension.

Patients and Methods: In a retrospective clinical study, the authors compared pressure-lowering effect of SLT in 2 groups of patients; group 1 (83 patients) received SLT on 180°, group 2 (30 patients) on 360° of trabecular meshwork. The clinical outcome indicators were the intraocular pressure of 1 day, 1 week, 1 month, 2 months, 3 months and 6 months after SLT, and the anterior chamber reaction at post-laser 1 day.

Results: There was no statistically significant difference in the pressure reduction between these two regimens after six months. Success rate of group 2 (43.3%) was higher than that of group 1 (31.3%) without statistical significance ($p = 0.23$). The anterior chamber reaction of two groups showed significant difference (group 1; 0.61 ± 0.64 , group 2; 1.25 ± 0.83 , $p = 0.001$).

Conclusions: SLT on 180° of trabecular meshwork has a similar effect compared to SLT on 360° of trabecular meshwork. We suggest that 180° SLT is the safest procedure with regard to its success rate and complications.

P537 SELECTIVE LASER TRABECULOPLASTY: PRIMARY TREATMENT FOR PRIMARY OPEN-ANGLE GLAUCOMA

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Background: Selective laser trabeculoplasty (SLT) has recently become the treatment of choice for glaucoma. It is a Q switched, frequency doubled, Nd: YAG Laser with $\lambda = 532$ nm that delivers a short energy pulse to the trabecular meshwork, which then creates openings in the drainage area of the eye to release the buildup of aqueous fluid. The purpose of this study is to evaluate the effectiveness of SLT as primary treatment in treating Primary Open-Angle Glaucoma (POAG)

Methods: Patients who were diagnosed with POAG were selected for this study. Thirty-five eyes of 23 participated patients were treated with SLT as primary treatment. The intraocular pressure of each eye was measured before treatment, then after 1 hour, 1 week, 1 month, 3 months, and 6 months after the procedure.

Results: The intraocular pressure (IOP) of 35 eyes reduced significantly after one SLT treatment. At 1 hour after treatment, IOP reduced 3 mmHg (18.70%); at 1 week, 1 month, and 3 months the IOP reduced approximately 4.2 mmHg (24.00%); at 6 months, the IOP measurement showed a greater reduction, 5 mmHg (30.39%).

Conclusion: The data showed that intraocular pressure was effectively reduced in patient with primary open-angle glaucoma after selective laser trabeculoplasty treatment. The results suggested that SLT could be used as the first line of treatment in place of medications. In compare with glaucoma medications, SLT was safe and worked quickly in reducing IOP on its first treatment. With selective laser trabeculoplasty, patients would save cost, depend less on glaucoma medications, and therefore get less side effects.

P538 ABSTRACT WITHDRAWN

Surgical Treatment: Trabeculectomy

P539 MODIFIED REVERSE SCLERAL FLAP DISSECTION DURING GLAUCOMA SURGERY

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Background: Scleral flap dissection during glaucoma surgery, whether penetrating or non-penetrating glaucoma surgery, is critically important. Classically a knife is used for dissection starting from the sclera and going centrally towards clear cornea. This might lead to irregular flap dissection. Recently the Crescent blade is used; however premature anterior chamber entry might occur.

Methods: In this technique a 4x4-mm scleral flap is outlined. The crescent blade is then introduced horizontally to create a tunnel parallel to the limbus and under the middle of the flap passing from the right to the left in case of right-handed surgeons. The crescent is then moved centrally towards the corneal periphery, then moved backwards to separate the flap from the sclera.

Results: The technique has been applied on 30 eyes scheduled for trabeculectomy. Non-penetrating glaucoma surgery, and combined surgical techniques. Homogenous flaps were obtained with excellent exposure of the corneal periphery.

Conclusion: Modified reverse scleral flap dissection during glaucoma surgery is a promising modification that facilitates scleral flap dissection.

P540 TRANSCONJUNCTIVAL ANTERIOR CHAMBER FILTRATION IN SURGICAL MANAGEMENT OF GLAUCOMA

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Background: Conjunctival lymphatics play an important role

in regulating subconjunctival fluids and they act as flood drains after filtration surgery. Most of the glaucoma surgery techniques used today is grossly destructive to conjunctival lymphatics. Preparations of conjunctival and scleral flaps in penetrating or non-penetrating surgeries, application of thermal and bipolar cautery destroy lymphatics. Development of new surgical techniques using new technologies, which help not only in preserving the conjunctival lymphatics but also reduce the surgical trauma, is very relevant in today's glaucoma surgery scenario. Fugo plasma blade uses plasma energy to cut and ablate tissue. There are no collateral damages in the surrounding tissue. It also ablates blood vessels in its path. This instrument makes incision, gutters, and tracks exactly as required. A new transconjunctival anterior chamber filtration (TCACF) procedure, where 100 micron tip of plasma blade was used to make a track through conjunctiva and limbus into AC has been developed. Surgical trauma is minimal. The surgery does not require any dissection, hence preserves the needed lymphatics.

Purpose: To evaluate the efficacy and safety of TCACF procedure in surgical management of open-angle glaucoma (OAG).

Methods: The study was undertaken under the innovative educational program of the Russian people's friendship university, Moscow, Russia. Early postoperative results of TCACF procedure in 12 cases of OAG were analyzed. Among these there were 4 cases with coexisting pathology having undergone combined phacoemulsification with lens implantation and TCACF procedure. IOP before operation was 34 ± 2.6 mmHg. All patients were instilling maximum number of glaucoma medication. Surgical technique included following steps: 1. Conjunctiva was slid toward the cornea and held down at the limbus; 2. An activated 100 micron tip of Fugo plasma blade was passed through conjunctiva and limbus making a track of 125 micron width into anterior chamber (AC) followed by irrigation of AC with 0.025% carbachol solution and air injection; 3. Tenon's tissue near the track outlet was infiltrated with 0.02% solution of mitomycin C to prevent its fibrosis and blockage; 4. Conjunctival hole was closed with one suture. In immediate postoperative period, patient instilled 1% solution of pilocarpine 2-3 times daily to keep the pupil constricted and iris away from the inner lumen of the track. Main outcome measures were IOP changes, complication rate, additional glaucoma medication and need for surgical revision. Follow-up period – 3 months.

Results: IOP was controlled in all cases. Filtration blebs were diffuse and borderless. Blanching of the conjunctival tissue was minimal. Mean IOP decrease was 20.1 ± 2.1 mmHg (range 12-28 mmHg, $p = 0.01$). In 5 cases (41.7%) the inner track opening was blocked by iris tissue resulting in flattening of filtration bleb and rise in IOP. The track was successfully reopened with one shot of YAG laser. In 1 case choroidal effusion occurred, which was treated with scleral trephination. Additional glaucoma medications and repeat surgery was not required.

Conclusion: Early results showed efficacy and safety of TCACF in management of OAG and in combined surgery for coexisting pathology.

P541 TEN YEARS EXPERIENCE IN THE USE OF DRAINAGE COLLAGEN ANTI-GLAUCOMATOUS DCA XENOPLAST IN THE SURGICAL TREATMENT OF DIFFERENT CLINICAL FORMS OF GLAUCOMA (RESULTS OF A MULTI-CENTER STUDY)

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Background: During the study estimated the efficiency of the use of anti-glaucomatous microdrainage, based on biological material Xenoplast (DCA Xenoplast), by data of international multi-center study.

Methods: Drainage collagen anti-glaucomatous DCA Xenoplast is made from highly purified bone collagen animal genesis. By this material was made plastic of glaucomatous changed segment of trabeculae, because structure of bone collagen can repeat the structure of the trabeculae tissue of the human eye. In 10 clinics in Russia, in 2 in Ukraine and in the ophthalmological clinic in Haleb (Syria) during ten years were made 2989 anti-glaucomatous operations at different stages and clinical forms of glaucoma. Among them, 100 penetrating operations were made for children from 3 to 8 years with congenital glaucoma in the advanced and far-advanced stages. Non-penetration deep sclerectomy (NPDS) – 2002, deep sinustrabekulektomy – 919, angularly-uveal draining – 34, valvular deep sinustrabekulektomy – 4, draining of suprauveal space ab interno – 30. Follow-up period was 2 – 10 years. Estimated the degree of post-operative reaction of the eyeball, and complications in early and long-time post-operative period, hypotensive effect of surgery during the full period of observation, the need for use of additional surgical treatment.

Results: All participants of international multicenter study noted a total biological inactivity of DCA Xenoplast in the early and long-time post-operative period. There were no complications related to exclusion, dislocation, perforation or incapsulation of the DCA Xenoplast. In neither case did not need to delete DCA Xenoplast. Observation of patients in the dynamics showed saving of IOP ($P_o = 18.5 \pm 2.5$ mmHg) during a long-time period – up to 5-6 years after surgery in all patients. In the early postoperative period choroidal detachment was on average $11.2 \pm 1.5\%$ cases ($4.2 \pm 1.5\%$ – posterior trepanation of sclera was performed), hyphema – to $4.5 \pm 1.2\%$ of cases. Repeated operations in 2-5 years later were performed in $3.3 \pm 0.5\%$ of cases, YAG – laser goniotomy were performed in $26.3 \pm 1.5\%$ of cases. YAG – laser goniotomy provides a good hypotensive effect and 2-4 years later after NPDS with DCA Xenoplast.

Conclusions: 1. DCA Xenoplast is drainage with exclusively high characteristics of biocompatibility. 2. Data of international studies in different clinics in Russia, Ukraine and Syria showed, that the use of DCA Xenoplast effectively lowers IOP to a tolerant level and supports the newly started ways outflow of intraocular fluid after anti-glaucomatous operations of penetrating and non-penetrating type.

P542 LONG-TERM RESULTS OF PRIMARY TRABECULECTOMY IN A DEVELOPING COUNTRY

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Background: Glaucoma is common in Saudi Arabia, and its management is challenging.

Method: Long-term efficacy and safety of primary trabeculectomy \pm antimetabolite were assessed by reviewing patients who had the procedure at King Abdulaziz University Hospital between, January 1988 and December 2007. Patients who had, previous surgery, congenital glaucoma, or follow up less than 3 years, were excluded. Success defined as intraocular pressure ≤ 21 mmHg with and without medications.

Results: Fifty-nine eyes of 59 patients, 30 male and 29 female, with a mean age of 61.4 years reviewed. Only patients who had primary open-angle glaucoma met the inclusion criteria. Mean intraocular pressure reduced from 25.1 to 16.3 mmHg, with and without anti glaucoma medications in 50 eyes (84.8%) at a mean follow up of 8.5 years. Success rate did not improve significantly ($p < 0.7225$) with adjunctive anti metabolite. Kaplan-Meier life-table showed reduction of success rate over time; 96.6%, 81.2%, and 75.4% at 5, 10 and 15 years respectively. There was a reciprocal significant association between success rate and the number of pre-operative topical medications ($p < 0.0012$), and argon laser trabeculoplasty ($p < 0.0051$). Resident's in Training success rates were comparable to that of principle author. No serious complications. Nine eyes showed deterioration of vision, mainly due to cataract.

Conclusion: Primary Trabeculectomy is a safe, effective, and a suitable training procedure in a developing country.

P543 INCIDENCE, RISK FACTOR AND THE EFFECT OF FLAT ANTERIOR CHAMBER AFTER TRABECULECTOMY

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Background: Flat anterior chamber is a complication after trabeculectomy. The reported incidence of flat anterior chamber after trabeculectomy ranges between 13.0~23.9%. Persistent flat anterior chamber causes peripheral anterior synechiae, cataract, endothelial dysfunction and postoperative visual acuity loss. The objects of our study is to investigate the incidence, risk factor and the long term effect of flat anterior chamber after trabeculectomy with mitomycin C.

Methods: Consecutive fifty-hundred-seventy-four eyes of 440 patients that underwent trabeculectomy or phacotrabeculectomy with mitomycin C were evaluated. Flat anterior chamber was divided into three grades. Grade 1 was defined as contact between the iris and cornea with touch limited to the periphery of the iris, grade 2 as entire irido-corneal touch and Grade 3 as total apposition between the iris and cornea and also contact between the lens and the cornea. Incidence of flat anterior chamber was evaluated. Risk factor for flat anterior chamber was analyzed by logistic regression model. To identify the hazards ratios (HRs) for the failure of trabeculectomy for 5 years, multivariate Cox proportional hazards regression analysis was performed.

Results: The number of flat anterior chamber cases was: grade 1-3, 127 (127/574 = 21.1%), grade 1, 81 cases (81/574 = 14.1%), grade 2, 38 cases (38/574 = 6.6%), grade 3, 8 cases (8/574 = 1.4%). Adjusted Odds Ratio (OR) of flat anterior chamber was; grade 1-3, preoperative pseudophakia 0.30 (95% CI, 0.15-0.60), aphakia 0.34 (95% CI, 0.12-0.97), the number of previous lectomy 1.35 (95% CI, 1.02-1.72); grade 2-3 flat anterior chamber; preoperative pseudophakia 0.16 (95% CI, 0.06-0.46), type of glaucoma is chronic angle closure glaucoma 4.86 (95% CI, 1.26-18.7), the number of

previous lectomy, 2.34 (95% CI, 1.59-3.43), limbal-based flap 3.02 (95% CI, 1.25-7.33). No significant difference was observed between formed anterior chamber group, FAC group, and grade 2-3 FAC group with the incidence of postoperative bullous keratopathy or postoperative cataract formation by fisher exact test In Cox proportional hazard regression, postoperative flat anterior chamber was not associated with the success rate of trabeculectomy (grade 1-3, HR 1.17; 95% CI, 0.75-1.83, grade 1, HR 0.90, 95% CI 0.51-1.57; grade 2-3, HR 1.17, 95% CI, 0.64-2.11).

Conclusions: Grade 1-2 flat anterior chamber is not a rare complication after trabeculectomy. Postoperative flat anterior chamber itself may not be the cause of failure of trabeculectomy.

P544 OUTCOMES OF TRABECULECTOMY WITH AND WITHOUT MITOMYCIN C FOR JUVENILE ONSET PRIMARY OPEN-ANGLE GLAUCOMA: A PROSPECTIVE RANDOMIZED STUDY

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Background: There is no prospective study that has compared the outcomes of trabeculectomy with and without mitomycin among juvenile onset primary open-angle glaucoma eyes (JOAG). We aimed to evaluate the outcomes of trabeculectomy with and without intra operative subconjunctival application of mitomycin among eyes with JOAG.

Methods: This was a prospective randomized case control study where 24 eyes of 16 JOAG patients were randomized to trabeculectomy with and without mitomycin. A standard trabeculectomy using a fornix based conjunctival flap was performed. Mitomycin 0.2 mg/ml was placed under the conjunctiva using 2 PVA sponges for 2 minutes in group 1, while no mitomycin was used in group 2. After trabeculectomy, the scleral flap was sutured with two releasable sutures and one central fixed suture using 10-0 Monofilament nylon. Patients were followed up at week 1, 2, 3, 4 6 and thereafter at 2, 3, and 4 months till the last follow up at 6 months.

Results: Mean age of patients that underwent trabeculectomy with mitomycin (n = 14) was 25.5 ± 10 years – not significantly different from those in the group that underwent trabeculectomy without MMC (n = 10) (31.5 ± 11 years) (p = 0.185). Mean baseline intraocular pressure (IOP) in group 1 was 44.8 ± 9.5 mmHg; not different from group 2 (47.7 ± 14 mmHg) (p = 0.56). Mean IOP 6 months after trabeculectomy in group 1 was (9.6 ± 4.3 mmHg); lower but not significantly different from group 2 (14.8 ± 6.3 mmHg) (p = 0.14). All eyes achieved > 40% reduction of IOP from baseline after trabeculectomy. An IOP < 18 mmHg at 6 months was achieved in 13 out of 14 eyes in group 1 and 7 out of 10 in group 2 (p = 0.23). Three out of 14 eyes (21%) that underwent MMC augmented trabeculectomy needed cataract surgery while none in group 2 developed a visually significant cataract (p = 0.27).

Conclusions: IOP reduction at 6 months with and without the use of mitomycin for trabeculectomy is similar among JOAG eyes, however visually significant cataract development within 6 months was a risk in the mitomycin group. A longer follow-up of is envisaged to determine the long term outcomes of mitomycin augmented trabeculectomy in these eyes.

P545 A TWENTY-YEAR FOLLOW-UP STUDY OF TRABECULECTOMY: RISK FACTORS AND OUTCOMES

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Background: Few studies have followed trabeculectomy patients for longer than 10 years or compared multiple risk factors for trabeculectomy failure within the same cohort. However, as the population ages it will be important to know how well a trabeculectomy procedure may perform over a much longer period of time. This study was undertaken to determine the performance of trabeculectomy surgery over a 20 year period and examine the associations between outcome and risk factors for trabeculectomy failure.

Methods: Patients who had undergone trabeculectomy surgery at Addenbrooke's Hospital, Cambridge, UK between January 1988 and December 1990 were identified through surgical logbooks (n = 521 procedures on 380 patients). A case-note review was undertaken, which identified 234 patients (330 procedures) who had available case-notes. Patients' notes were examined to determine the success of their trabeculectomy surgery and if applicable, the point at which it was no longer successful. Surgical success was defined as 'complete success' while intraocular pressure (IOP) remained < 21 mmHg with no additional medication and 'qualified success' if those requiring additional topical medication were included. Functional success was defined if patients did not progress to legal blindness (visual acuity worse than 3/60 or visual field less than 10°). Information regarding patient age at diagnosis, co-morbidities, type of glaucoma, number of medications used at the time of surgery, severity of visual field loss pre-operatively, previous surgery and IOP at diagnosis was collected and used in the analysis of associated risk factors for trabeculectomy failure and blindness.

Results: After 20 years of follow-up, 57% and 88% were classified as complete and qualified success respectively and 15% had become blind. Following trabeculectomy, 13% of eyes failed the definition of complete success during the first year (6% in the first 2 months and 7% in the subsequent 10 months). Thereafter, 1.6% of eyes failed per year for the next 19 years. Seven percent of eyes failed the definition of qualified success during the first 5 years, with 0.3% of eyes failing per year for the next 15 years thereafter. Eyes became blind with an incidence of 0.8% per year throughout the entire 20 year period of follow-up. Those who were most at risk of trabeculectomy failure were younger or had uveitic glaucoma. Those with pseudoexfoliation or aphakia were more likely to progress to blindness. Furthermore, those using 2 or more topical medications or with advanced visual field loss at the time of surgery, were most at risk of both trabeculectomy failure and blindness.

Conclusions: This study indicates that trabeculectomy survival at 20 years may be almost 60% with no topical medication and almost 90% with additional topical medication. Trabeculectomy surgery is therefore a long-term solution to intraocular pressure control. Patient age, pre-operative topical medication use, glaucoma type and glaucoma severity will independently influence this outcome. Patients are more at risk of blindness if they have pseudoexfoliative glaucoma, if they used 2 or more topical medications at the time of

surgery, or if they have advanced visual field loss pre-operatively.

P546 RECOVERY OF NEURORETINAL RIM OF THE OPTIC DISC IN THE EYE WITH UNILATERAL CONGENITAL ECTROPION UVEAE AND GLAUCOMA AFTER FILTRATION ANTI-GLAUCOMATOUS SURGERY

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Background: Congenital ectropion uveae (CEU) is a rare, non-progressive condition insufficiently and rarely mentioned in the ophthalmologic literature. Etiologically, ectropion uveae can be classified into two groups: acquired and congenital. CEU is characterized by the ectropionated pigment epithelium layer on the front surface of the iris from the pupillary ruff, anterior insertion of the iris, dysgenesis of the iridocorneal angle and glaucoma.

Some studies have also found CEU joined with congenital anomalies and hereditary diseases.

Methods and Results: In this case report we present a seven-year-old girl with unilateral ectropion uveae joined with iridotrabecular dysgenesis and glaucoma. The examination included IOP measurements with Goldmann Applanation Tonometry (GAT), the examination of chamber angle using indirect gonioscopy, visual field tests by computerized perimetry and also *papillae nervi optici* (PNO) examination by using Heidelberg Retinal Tomography II (HRT II). Conducted clinical examinations have revealed no hypoplasia of the iris stroma, nor any present neovascularisation and spontaneous hyphemas, nodules, neoplasms, other abnormalities of the iris or underlying systemic diseases. Since local anti-glaucomatous therapy failed to normalize the intraocular pressure (IOP) in the affected eye, and changes on *papillae nervi optici* (PNO) caused by glaucoma were evident, confirmed by HRT II and evolving in the loss of NR rim and increase in cup/disc ratio (C/D = 0.626), so the findings of Moorfields regression analysis were classified as 'outside normal limits'. This is why trabeculectomy (TTR) was performed. The procedure (TTR) not only normalized the IOP, but induced neuroretinal rim PNO recovery confirmed by HRT II, reflected by the reduction in cup/disc ratio (C/D = 0.330) and restitution of NR rim area and volume. On the last follow up HRT II examination dated 18 months after the procedure NR rim was found to be preserved in all its segments, so the findings of Moorfields regression analysis were classified as 'within normal limits'.

Conclusion: CEU is a very rare iris malformation, with a high percentage of joined glaucoma. Glaucoma onset is usually in childhood or adolescence, but cases with later presentation were also described. IOP shows an initial drop after the therapy is introduced, but values rise up shortly and most cases demand filtration surgery. In this case report, evident and HRT II confirmed recovery of the NR rim after TTR, in aspect of rim area and volume increase, as well as reduction in C/D. Although CEU is nonprogressive and benign eye disease, it takes a high degree of caution to detect the associated glaucoma (which can have an early or late onset) as soon as possible, so that an irreversible optic disc neuropathy can be prevented with surgery.

P547 TRABECULECTOMY WITH INSTALLATION OF A 'RECOVERY PORT' TO DEAL WITH POSTOPERATIVE ELEVATION OF INTRAOCULAR PRESSURE

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Introduction: Trabeculectomy (LET) is often used for the surgical treatment of glaucoma. If the intraocular pressure (IOP) rises after LET, filtration bleb reconstruction by needling or conjunctival incision is performed. However, the outcome of filtration bleb reconstruction is not always satisfactory. I recently devised a new technique for LET which involves a recovery port (RP) for use in dealing with postoperative elevation in IOP. This technique is reported herein.

Methods: 1. Preparation of the recovery port: LET involves incision of the corneal limbus and preparation of double scleral flaps. The first scleral flap is treated with mitomycin C. A 1-mm V-lance (recovery port knife) is inserted via the middle of the corneal side of the scleral bed created with the first scleral flap and advanced through the cornea to create a pathway on corneal surface 1.5-2 mm distant from the corneal limbus. This is followed by routine manipulations to create the second sclera flap and to complete LET. 2. Use of the recovery port: In cases showing postoperative elevation of the IOP, an irrigation cannula is inserted via the side port of the cornea into the anterior chamber for the purpose of irrigation and eyeball fixation. If a adhesion freeing needle (RP freeing needle) is inserted, it enters the space below the first scleral flap. If it is further advanced, scleral flap adhesion and adhesion of the bleb-narrowing area can be freed. The RP then undergoes self-closure.

Results: LET with RP was performed on 37 eyes during one year (from December 2009 to December 2010). The mean final IOP was 10.8 mmHg, the mean number of the dose of an anti-glaucoma drug ophthalmic solution was 0.7, and the mean follow-up period was 5.8 months. The recovery port was used for 11 eyes showing postoperative IOP elevation after LET. Bleb reconstruction was easy for 8 eyes for which reconstruction was done within 1 month after LET. For these 8 eyes, the final postoperative IOP was 12.6 mmHg and the course after reconstruction was favorable. Freeing of the adhesion was difficult in some cases where freeing was attempted a long time after surgery.

Conclusion: We devised a new technique (the recovery port) for reducing the IOP in cases showing IOP elevation after LET. The recovery port can be easily installed during the routine LET operation. Upon postoperative IOP elevation, adhesion can be freed in a reliable manner if the port is used without delay. Installation of this RP during LET is desirable to achieve better IOP control after LET.

P548 SURGICAL MANAGEMENT OF EXUBERANT BLEB FORMATION FOLLOWING TRABECULECTOMY WITH BLEB-LIMITING CONJUNCTIVOPLASTY USING FIBRIN ADHESIVE

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Background: Exuberant circumferential bleb formation often occurs following trabeculectomy, often making it necessary for the surgical intervention. Various surgical techniques have been reported such as bleb window cryopexy, autologous

blood injection, laser ablation and resuturing of sclera flap. We herein describe a novel surgical technique incorporating the use of fibrin adhesive combined with bleb-limiting conjunctivoplasty for the repair of circumferential bleb formation following trabeculectomy.

Methods: This case series study included five eyes of 5 consecutive patients who developed exuberant bleb with hypotony following trabeculectomy which persisted more than 1 month. Surgical intervention was performed as like the following. Radial conjunctival and Tenon's capsule incisions were made down to the bare sclera at about 1 mm away from the a-vascular bleb margin, and the dissection was performed posteriorly. The incised edges of Tenon's capsule were attached onto the sclera with 9-0 nylon interrupted sutures. Fibrin adhesive glue was applied into the space between the sclera and the overlying conjunctiva and Tenon's capsule in the circumferential bleb area to create a firm adhesion between the tissues. Finally, conjunctiva was resutured with 9-0 vicryl continuous sutures.

Results: Flattening of the circumferentially exuberant bleb and restoration of conjunctiva morphology was noted immediately after surgery in all cases. Hypotony resolved within weeks following the procedure. There was neither serious complication nor bleb recurrence during the follow-up period.

Conclusion: The novel fibrin adhesive-assisted conjunctivoplasty procedure appears to be a safe and effective treatment for symptomatic circumferential trabeculectomy blebs.

P549 USE OF AMNIOTIC MEMBRANE IN TRABECULECTOMY OPERATIONS IN EGYPT

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Background: 25 cases of chronic open-angle glaucoma were chosen from the glaucoma clinics of RIO, 15 cases of previously failed procedure and 10 cases newly operated.

Material and Methods: The procedure was done by the same surgeon in all cases, the IOP at the time of operation varies from 40 mmHg up to 50 mmHg paracentesis was done prior the fistula window opening. AMM was sutured in all cases upon the scleral bed under the scleral flap, the fistula was done in both scleral bed and AMM. Closure of the scleral flap by 10/0 sutures. Closure of the conjunctiva and follow up for 12 months in intervals of ; one W, 2 Ws, 1 M, 3 M, 6 Ms, 9 Ms and 12 Ms.

Results: Postoperative IOP varies 10-14 mmHg during the follow-up period with reduction. In 5 cases an addition implantation of the AM above the scleral flap follow-up shows no statistical difference than one layer implant below the flap.

Conclusions: AM implantation is a safe procedure as fibrolytic agent in cases of trabeculectomy especially in refractory cases. The disadvantage of time consuming operation and hard to handle the membrane should be considered. Although the great advantage of a very cheap anti-fibrotic agent in our country should be highly considered and get benefits from the over population problem.

P550 RISK FACTORS FOR EARLY POSTOPERATIVE BLEB LEAKAGE AFTER TRABECULECTOMY

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Purpose: Early postoperative bleb leakage is a common complication of trabeculectomy using fornix-based conjunctival flap. We elucidated risk factors for early postoperative wound leakage that occurred in eyes with trabeculectomy.

Methods: We retrospectively reviewed the medical records of glaucoma patients who underwent trabeculectomy with mitomycin C between June 2005 and December 2010. The study included patients who were treated with an identical surgical technique with a fornix-based conjunctival flap, which was created by a radial incision and a limbus-parallel incision. If both eyes underwent trabeculectomy, only the eye treated first was included. Bleb wound leak was defined as aqueous leakage from the bleb that was confirmed by fluorescein staining. Age, sex, either left or right eye, previous eye surgery associated with conjunctival incision, preoperative intraocular pressure were analyzed for the potential risk factors for bleb wound leakage in logistic regression analysis. $p < 0.05$ was considered statistically significant.

Results: Four hundred twenty eyes (420 patients) satisfied the study criteria. Bleb wound leakage after trabeculectomy were found in 108 eyes (25.7%). An additional suture was required in 25 eyes (23.1%) of the 108 eyes while leakage spontaneously stopped in the other eyes (76.9%). Logistic regression analysis showed the left eye (odds ratio = 1.69, $p = 0.0264$) was a significant risk factor for bleb wound leakage while the others were not significant.

Conclusions: Bleb wound leakage occurs more frequently in left eyes than right eyes after trabeculectomy. The leakage does not depend on preoperative patient characteristics. Rather, it may be involved in the difficulty of conjunctival suture because it depends on eye laterality (left or right) that underwent trabeculectomy.

P551 THE EFFECT OF AQUEOUS MONOCYTE CHEMOTACTIC PROTEIN-1 CONCENTRATION ON THE SHORT-TERM FAILURE OF TRABECULECTOMY WITH MITOMYCIN C IN EYES WITH OPEN-ANGLE GLAUCOMA

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Background: Subconjunctival inflammation was considered as an important factor for the failure of trabeculectomy. However, effects of aqueous pro-inflammatory cytokines on the results of trabeculectomy were remained unknown. The aim of this study was to evaluate the effect of aqueous monocyte chemotactic protein (MCP)-1 concentration on the short-term failure of trabeculectomy with mitomycin C in eyes with open-angle glaucoma.

Methods: Aqueous samples were collected from 23 eyes with primary open-angle glaucoma and 20 eyes with exfoliation glaucoma at the beginning of trabeculectomy, and the concentration of MCP-1 was measured via a multiplex immunoassay. Multiple regression analysis was used to determine the main background characteristics affecting the concentration of MCP-1. The primary endpoints for surgical failure were persistent intraocular pressure of ≥ 21 mmHg, deterioration of visual acuity to no light perception, or additional glaucoma procedures. Multivariable analysis was performed with the Cox proportional hazards model, in which a subgroup analysis was performed for 28 eyes without the history of cataract surgery.

Results: The mean concentration of MCP-1 was 1.55 ng/mL (range, 0.56 to 3.64 ng/mL), and was positively related to age, male sex, and the history of cataract surgery ($p < 0.01$, $= 0.03$, and < 0.01 , respectively). The mean follow-up period was 19.5 months (range, 1.0 to 30.8 months). The multivariable model showed that higher MCP-1 concentration (relative risk, 3.17/ng/mL; $p < 0.01$) was prognostic factors for surgical failure. In eyes without the history of cataract surgery, higher preoperative intraocular pressure and higher MCP-1 concentration were prognostic factors (relative risk, 1.19/mmHg and 17.27/ng/mL; $p = 0.03$ and < 0.01 , respectively).

Conclusion: The concentration of MCP-1 is related to surgical failure of trabeculectomy with mitomycin C in eyes with open-angle glaucoma.

P552 OUTCOME OF FORNIX-BASED VERSUS LIMBAL-BASED CONJUNCTIVAL FLAPS IN TRABECULECTOMY

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Purpose: To compare the surgical outcomes and bleb morphology of limbal-based group with that of fornix-based group undergone trabeculectomy with mitomycin C (MMC).

Methods: 65 eyes of 59 patients with trabeculectomy with MMC who were observed for 1 year or more were included in the study. A limbal-based conjunctival flap was used for 34 eyes of 31 patients and a fornix-based conjunctival flap for the other 31 eyes of 28 patients. We classified and compared the bleb morphology according to the Moorfield Bleb Grading System after 1 year or more postoperatively, and evaluated intraocular pressure, success rates.

Results: There was no significant difference in the IOP and success rate in two groups. The central bleb vascularity of the limbal-based group was statistically significantly lower than that of fornix-based group ($1.79 \pm 0.64 : 2.16 \pm 0.73$, $p = 0.042$). The risk of cystic bleb formation was higher in the limbal-based group ($38.2\% : 16.5\%$, $p = 0.047$).

Conclusions: There was no difference between the groups in the IOP and cumulative success rate, but fornix-based group was recommendable concerning the low risk of cystic bleb formation.

P553 SYMPATHETIC REACTION IN FELLOW EYE FOLLOWING TRABECULECTOMY FOR PRIMARY ANGLE-CLOSURE GLAUCOMA – A CASE REPORT

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Background: Sympathetic ophthalmia is a rare bilateral granulomatous non necrotizing pan uveitis that occurs after either surgical or accidental trauma to one eye-exciting eye that elicits an inflammatory response in the fellow eye-symphathizing eye ,usually within 3 months(80%),and 1 year (90%). It has been deduced that this inflammation is an auto-

immune inflammatory response against choroidal melanocytes mediated by T cells. Patients present with asymmetric panuveitis, with more severe inflammation in the exciting eye. Clinical manifestations range from problems with near vision, mild photophobia, to severe granulomatous anterior uveitis. Posterior segment involvement in the form of vitritis, mid equatorial choroidal lesions are present. Diagnosis is clinical and it should be suspected following bilateral uveitis following trauma or surgery. Ocular surgeries such as vitrectomy, secondary IOL placement, trabeculectomy have been implicated in its etiology in addition to perforating injury with or without uveal prolapse.

Method: A 40 year old Asian female reported with clinical symptoms and signs suggestive of primary angle closure in the right eye. She had complaints of pain and redness with photophobia for the past 2 weeks, with intermittent such episodes in the past. Her best corrected visual acuity in the right eye was 6/9, left eye 6/12. Slit lamp biomicroscopy revealed corneal edema, shallow chambers, an imperforate peripheral iridectomy with mid dilated pupils in the right eye. The left eye was pseudophakic with a patent peripheral iridectomy, normal anterior chamber depth. Intraocular pressure with Goldmann Applanation Tonometry was 42 mmHg in the right eye and 12 mmHg in the left eye. Indentation Gonioscopy with Zeiss four mirror gonioscopes showed increased trabecular pigmentation with extensive broad based peripheral anterior synechiae for over 270 degrees of angle circumference. The left eye showed increased trabecular pigmentation with narrow angles. Stereoscopic evaluation of the disc revealed healthy discs with a cup disc ratio of 0.2 and healthy neuro-retinal rim in both eyes.

Result: Diagnosis of primary angle closure in the right eye was made and after appropriate medical management patient was subjected to trabeculectomy . Post operative convalescence was unremarkable with intraocular pressures of 15 mmHg. Patient was maintained on mydriatic-cycloplegics and topical steroids 2 nd hourly. Three weeks postoperatively patient presents with complaints of pain and redness in the left eye. Slit lamp examination revealed the presence of acute hypopyon iridocyclitis. The posterior segment was normal. The right operated eye showed mild anterior uveitis as well. Intraocular pressures remained under control in both eyes.

Conclusion: A clinical diagnosis of a sympathetic inflammatory reaction in the pseudophakic left eye was made. Patient was started on hourly topical steroids (prednisolone acetate) with mydriatic-cycloplegics in the left eye. Patient reported 1 week later with complete resolution of inflammatory reaction in the left eye. Patient was followed up for two month since surgery and the inflammation and intraocular pressure in both eyes remain under control . We report this case as a rare occurrence of sympathetic inflammatory reaction following trabeculectomy. An incidence of 0.8% has been estimated after glaucoma operations.

P554 ANTIMETABOLITES IN GLAUCOMA SURGERY – FOR EVERY PRIMARY TRABECULECTOMY OR IN COMPLICATED GLAUCOMA'S

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Backgrounds: Trabeculectomy as most common and still superior glaucoma surgical procedure during past decade has been performed in almost every glaucoma patient with

intraoperative application of antimetabolites, in order to ensure prevention of filtering bleb scarification and surgery failure. The study was conducted aiming to compare postoperative results regarding IOP regulation and postoperative complications between the groups of trabeculectomies with and without intraoperative application of 5 – Fluorouracil (5-Fu).

Methods: In the study have participated 60 glaucoma patients who have undergone trabeculectomy (32 patients with 5-Fu, 28 patients without 5-Fu). The selection of patients was as following: 42 patients with primary open-angle glaucoma, 8 patients with primary angle-closure glaucoma and 10 patients with pseudoexfoliative glaucoma. In the group with 5-Fu preoperative IOP values were ranged from 28.0 – 34.0 mmHg, and in the group without 5-Fu, registered IOP was 24.0 – 30.0 mmHg. As success rate were defined IOP values < 21.0 mmHg without any medical therapy. Follow-up period varied from 1 year until 14 years postoperatively.

Results: Postoperative IOP values within the two groups have shown no statistically significant difference regarding IOP and hypotony. But, statistical analysis of the data have registered more often complications referring to the filtering bleb morphology in the group of patients that have undergone trabeculectomy with 5 – Fu – more often occurrence of cystic and encapsulated blebs.

Conclusions: The intraoperative application of antimetabolites during trabeculectomy have proven to be safer surgical approach for prevention of filtering bleb scarification as complication that is threatening good surgical outcome. But, primary trabeculectomy in selected groups of glaucoma patients could be successfully performed as conventional treatment without intraoperative usage of antimetabolites in every primary trabeculectomy in non- complicated glaucoma's.

P555 OPTIMIZING TRABECULECTOMY: GREATER CONTROL OF OUTFLOW AND SAFER SURGERY

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Purpose: To assess the short term outcome of a modified trabeculectomy technique – the Moorfields Safer Surgery (MSS) system.

Methods: Trabeculectomy was performed using a fornix based conjunctival flap, an anterior chamber (AC) maintainer (Lewicky chamber maintainer), a standardised punch technique (Khaw's 0.5-mm Punch), and a combination of fixed and adjustable scleral sutures in 32 eyes of 28 patients. The main outcome measures were the postoperative intraocular pressure (IOP) and the rate of early postoperative complications. IOP was recorded on days 1-3, weeks 1-2, months 1 and 3.

Results: The mean IOP was 32.95 (SD 7.32) mmHg in the preoperative period. At the postoperative period was 8.56 (SD 2.11) mmHg in days 1-3; 10.6 (SD 4.46) mmHg in weeks 1-2; 10.75 (SD 4.15) mmHg in the first month and 10.83 (SD 2.5) mmHg in the third month. Postoperative complications were infrequent: flat anterior chamber (0%), bleb leakage (3.125%), hypotony (3.125%) in the first 2 weeks, or choroidal detachment at any time point (6.25%). One of the two adjustable sutures was adjusted in the first postoperative

days in 2 patients and removed in 3 patients. These technical modifications and adjustment allowed us to obtain an IOP of 10.83 (SD2.5) mmHg in the third month after surgery. Four patients required one or more IOP lowering drugs after trabeculectomy, and needle revision of inadequately filtering bleb was necessary once in 3 patients and twice in two patients.

Conclusions: Trabeculectomy is the most common operation performed for glaucoma worldwide. However, it is usually described with significant complications, many of which result from overdrainage of aqueous. This novel trabeculectomy method, developed by Prof. Peng Khaw, includes the use of adjustable sutures, an AC maintainer and a punch. Taken together, these results indicate that this new trabeculectomy technique is safe, allowing the possibility to tailor the IOP postoperatively with minimal postoperative complications and excellent IOP control at the short term follow-up.

P556 RISK FACTORS FOR CHOROIDAL DETACHMENT AFTER TRABECULECTOMY

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Purpose: To determine risk factors for choroidal detachment after trabeculectomy for glaucoma.

Methods: We retrospectively reviewed the medical records of patients who were treated with fornix-based trabeculectomy for glaucoma between June 2005 and December 2010. Risk factors of choroidal detachment after trabeculectomy were determined with logistic regression analysis. Pre- and post-operative factors analyzed were age, gender, laterality, pre-operative intraocular pressure (IOP), history of previous cataract surgery and post-operative IOP.

Results: Four hundred twenty eyes (420 patients) satisfied the study criteria. One hundred ninety-four eyes (194 patients) of 420 eyes were open-angle glaucoma. Seventy-nine eyes were defined as choroidal detachment after trabeculectomy. Logistic regression analysis showed that age (odds ratio [OR] = 1.03/year, $p = 0.0068$) and post-operative IOP (OR = 0.89/mmHg, $p \leq 0.0001$) were risk factors for choroidal detachment after trabeculectomy. A subgroup analysis for eyes with open-angle glaucoma showed that age (OR = 1.06/year, $p = 0.0075$) and post-operative IOP (OR = 0.89/mmHg, $p = 0.0025$) were significant risk factors for choroidal detachment after trabeculectomy.

Conclusions: Our present study demonstrates that older age and lower post-operative IOP are risk factors for choroidal detachment after trabeculectomy for glaucoma patients. Also in eyes with open-angle glaucoma, older age and lower post-operative IOP are risk factors for choroidal detachment after trabeculectomy.

P557 RISK FACTORS FOR HYPHEMA AFTER TRABECULECTOMY WITH MITOMYCIN C

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Purpose: To elucidate the pre- and post-operative risk fac-

tors for hyphema after trabeculectomy with mitomycin C (MMC) in glaucoma patients.

Methods: We retrospectively reviewed the medical records of patients who were treated with trabeculectomy with MMC for glaucoma at Kumamoto University Hospital, Japan, between June 2005 and December 2010. All cases were treated with an identical surgical procedure, which consisted of fornix-based conjunctival flap incision, the creation of a half-layer triangle scleral flap, 0.4 mg/ml MMC incubation for 4 minutes, 3 sutures with 10-0 nylon for the scleral flap and conjunctival suture with 10-0 nylon. When both eyes underwent trabeculectomy, only the eye treated first was included. The logistic analysis was used to evaluate the risk factors for hyphema as an early postoperative complication (within 10 days) after trabeculectomy with MMC. The factors analyzed were age, gender, laterality, etiology of glaucoma, history of previous ocular surgery, history of anticoagulant medication, preoperative intraocular pressure, and postoperative intraocular pressure. $p < 0.05$ was considered statistically significant.

Results: Four hundred twenty eyes (420 patients) satisfied the study criteria. One hundred four eyes encountered hyphema after trabeculectomy with MMC. Logistic analysis showed the odds ratio for each factor; age (odds ratio = 1.00/year, $p = 0.98$), male (odds ratio = 1.49, $p = 0.14$), left eye (odds ratio = 1.34, $p = 0.22$), neovascular glaucoma (odds ratio = 2.41, $P = 0.0016$), past-eye surgery (odds ratio = 1.03, $p = 0.92$), and anticoagulant medication (odds ratio = 1.96, $p = 0.044$), preoperative intraocular pressure (odds ratio = 1.02/mmHg, $p = 0.18$), postoperative intraocular pressure (odds ratio = 0.98/mmHg, $p = 0.38$).

Conclusions: The present study demonstrates that neovascular glaucoma and history of anticoagulant medication are significant risk factors for hyphema after trabeculectomy with MMC.

P558 THE OUTCOME OF TRANS-CONJUNCTIVAL SCLERAL FLAP RESUTURING FOR HYPOTONY AFTER TRABECULECTOMY AND RISK FACTORS FOR FAILURE

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Purpose: To investigate the outcome of transconjunctival scleral flap resuturing (TCSFR) for hypotony after trabeculectomy and identify risk factors associated with failure.

Design: A retrospective, nonrandomized, non-comparative interventional study.

Methods: We analyzed 29 eyes that underwent TCSFR for hypotony maculopathy and/or choroidal detachment caused by excess filtration within 1 month after trabeculectomy (including combination with cataract surgery). All eyes were followed for at least 6 months after TCSFR. Intraocular pressure (IOP) before TCSFR was 4 mmHg or below. The primary outcome measure was the success rate of TCSFR. Successful IOP control was defined as the achievement of IOP over 4 and below 12 mmHg without medication, with the disappearance of hypotony maculopathy and/or choroidal detachment. Suture removal or laser suturelysis and needle revision were acceptable procedures to success, while additional surgical interventions such as bleb revision were regarded as failure. The risk factors for failure of IOP control were also

evaluated, including age, type of glaucoma, history of ocular surgery, IOP before trabeculectomy, duration between hypotony onset and TCSFR, IOP before TCSFR, number of suture, IOP at 1 and 4 weeks after TCSFR. Cox regression analysis was used to identify clinical factors contributing to the surgical outcome.

Results: In all patients, except 2 cases, hypotony maculopathy / choroidal detachment was resolved. In one maculopathy remained despite recovery of IOP and visual acuity. Another patient with serious choroidal detachment required additional scleral flap sutures with reopening the conjunctival flap after 1st TCSFR. Suture removal was performed in 22 eyes that showed high IOP after TCSFR, and needle revision was done in 11 of these eyes. In 2 eyes in which needle revision was not effective, surgical bleb revision was required for IOP control. No aqueous humor leakage or bleb-associated infection was observed. After a mean follow up of 16.5 ± 9.4 months after TCSFR, the mean IOP at the last visit was 10.4 ± 4.6 mmHg. Kaplan-Meier analysis of success rate was 65% at 6 months, and 61% at the last visit. Cox regression analysis identified IOP level at 1 week IOP after TCSFR as risk factors of failure to control IOP (hazard ratio = 1.33, = 0.02).

Conclusion: TCSFR is a recommendable technique as a treatment modality for hypotony caused by excess filtration after trabeculectomy. Because the IOP at 1 week after TCSFR may affect suitable IOP control, too tight TCSFR should be avoided.

P559 A COMPARISON OF LONG-TERM OUTCOMES BETWEEN TRABECULECTOMY WITH AND WITHOUT AMNIOTIC MEMBRANE TRANSPLANTATION FOR INTRACTABLE GLAUCOMA

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Background: Amniotic membrane transplantation (AMT) has been used to assist trabeculectomy based on the anti-fibrotic ability. However, the difference in the long-term control of intraocular pressure (IOP), surgical complications, and factors responsible for surgical failure between the AMT-assisted trabeculectomy and trabeculectomy alone has not been fully investigated.

Methods: A retrospective, nonrandomized comparative study was conducted for 74 eyes of 67 patients with high pressure glaucoma, who underwent trabeculectomy with or without AMT. All of them had a history of multi-previous intraocular surgeries including trabeculectomy, which caused severe conjunctival cicatrization. The AMT-assisted trabeculectomy was performed on 52 eyes of 47 patients (group A), whereas conventional trabeculectomy without AMT was performed on 22 eyes of 20 patients (group B). In group A, trabeculectomy with limbal-based conjunctival flap was performed with an adjunctive use of 0.4mg/ml mitomycin C. The amniotic membrane was then placed on the sclera with the epithelial side down. The limbal side edge of the amniotic membrane was secured with the sclera, whereas the fornix side edge was sutured with Tenon's capsule posteriorly to the conjunctival incision line. In group B, the same procedure except for the AMT was performed. Duration of the follow up was at least 12 months with a mean (\pm SD) of 63.5 ± 25.6 months. The number of prior surgeries was 3.0 ± 1.4 in group

A and 3.0 ± 1.0 in group B ($p = 0.89$, Mann-Whitney U test). The time course of changes in postoperative IOP and the number of anti-glaucoma medications and the frequency distribution of postoperative complications were evaluated. The IOP control was defined as success when the eyes had an IOP less than 21 mmHg regardless of the use of anti-glaucoma medications and needling revision. Kaplan-Meier analysis was performed in assessing the cumulative IOP success. The prognostic factors for surgical failure were assessed with the Cox proportional hazards model.

Results: The cumulative survival rate at 24, 36, 48, and 60 months was 63.4, 57.3, 52.6, and 52.6%, respectively, in group A and 58.7, 52.2, 37.3, and 0%, respectively, in group B ($p = 0.043$, log rank test). The mean postoperative IOP at 48 months was 15.3 ± 5.2 mmHg in group A and 18.0 ± 6.5 mmHg in group B ($p = 0.21$, unpaired t-test). The number of postoperative anti-glaucoma medications at the final visit was 1.6 ± 1.5 in group A and 2.7 ± 1.7 in group B ($p = 0.02$, Mann-Whitney U test). The late postoperative complications included persistent corneal edema (group A/B = 5/2), recurrent iritis (6/0), hypotony maculopathy (2/0), recurrent herpetic keratitis (1/0), persistent choroidal detachment (1/0), and bleb leak (1/1). The incidence of these complications in the two groups was not significantly different ($p = 0.15$, Fisher's exact probability test). The multivariate model showed that the needling revision (relative risk [RR] = 6.78, $p < 0.0001$) and a history of atopic dermatitis (RR = 7.11, $p < 0.001$) were the factors significantly associated with the surgical failure.

Conclusions: AMT may increase the successful IOP control of trabeculectomy and reduce the postoperative anti-glaucoma medications in intractable glaucoma eyes.

P560 PRE-OPERATIVE APPOINTMENT NON-ATTENDANCE AS A PREDICTOR OF TRABECULECTOMY SUCCESS

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Background: Trabeculectomy remains the most widely used surgical method for medically uncontrolled glaucoma. Despite advances in technique, including augmentation with antifibrotic agents, the long-term success continues to be challenging. It is widely accepted that proper postoperative care is as critical as good surgical technique. Post-operative care causes a significant burden for patients, with intensive post-operative topical steroid regimens and frequent hospital visits. We wanted to determine if patient compliance with pre-operative and post-operative treatment, using attendance of appointments as a surrogate measure, influenced long-term success of trabeculectomy surgery.

Methods: Fifty patients underwent Mitomycin-C augmented trabeculectomy between July 2003 and December 2004 in our tertiary-referral center. All surgery was performed or supervised by a single surgeon using a standard technique. Retrospective analysis of notes found 29 eyes of 25 patients (13 male) who had follow-up > 12 months and the long-term results of these patients will be discussed further. The failure to attend appointments (FTA) rate was determined by analyzing outcomes of all booked ophthalmology appointments for each patient, as recorded on the electronic patient information management system.

Results: Mean duration of follow-up after surgery was 4.68 years. Age at time of surgery averaged 70.67 years (range 29.57 to 86.76) and duration of anti-glaucoma treatment 8.59 years, with a mean of 3.5 different medications immediately prior to surgery. 48% of patients were Caucasian and 45% Afro-Caribbean. The majority (69%) had a diagnosis of primary open-angle glaucoma and 17% of eyes had previous failed-trabeculectomy surgery. Absolute-success (intraocular pressure (IOP) ≤ 15 mmHg without anti-glaucoma medications) was 41.4%. Qualified-success (IOP ≤ 15 mmHg with or without topical anti-glaucoma medication) was 65.5%, with average time to commencement of anti-glaucoma medication 6.47 months amongst all patients. Mean reduction in IOP from baseline pre-operative level was 42.36 % at latest follow-up. Duration of medication-free IOP control after surgery was significantly lower in Afro-Caribbean patients (14.0 months) compared to Caucasian patients (37.5 months) ($p = 0.032$). For the patients in whom trabeculectomy was ultimately unsuccessful (34.5%), the appointment FTA-rate was significantly higher both pre-operatively (16.23%) and post-operatively (16.61%) compared to those who had qualified-success (6.86%, $p = 0.013$ pre-operatively and 8.07%, $p = 0.035$ post-operatively). Patients who had absolute-success had almost half the FTA-rate pre-operatively (6.91% vs 12.34%), although this was not statistically significant ($p = 0.075$). There was no significant difference between the characteristics of those with higher FTA-rates in terms of age, gender, ethnicity, medical co-morbidities, pre-operative glaucoma treatment and surgical complications compared to those with lower FTA-rates, but patients with FTA-rate < 10% had an odds-ratio of 3.25 for qualified-success compared to those with FTA-rate > 10%. There was also no difference between the pre-operative and post-operative FTA-rate for individual patients ($p = 0.72$).

Conclusions: It is surprising that even a small difference in appointment attendance can significantly influence the overall success of trabeculectomy. This could be because failure to attend appointments correlates with poor treatment compliance, and indeed, patients who frequently missed appointments pre-operatively continued to do so post-operatively. This pilot study may allow patients who are at higher risk of trabeculectomy failure to be identified pre-operatively and targeting treatment adherence strategies could increase their likelihood of successful surgery.

P561 OUTCOME OF TRABECULECTOMY WITH IGEN (BIODEGRADABLE COLLAGEN MATRIX IMPLANT)

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Background: Trabeculectomy was introduced in 1968 and is commonly performed for the treatment of glaucoma. However, wound healing results in fibrosis of the bleb and obstruction of the drainage fistula and subsequent bleb failure. Antifibrotic agents are commonly used to enhance the success of a trabeculectomy. The use of antimetabolites are, however, not without the risks of hypotony, bleb leakage and infection. Recent studies in animals have demonstrated the effectiveness of bio-engineered, biodegradable, porous collagen-glycoaminoglycan matrix implants in the subconjunctival space in modulating the wound healing process following trabeculectomy. The purpose of this study was to

report on the outcome of trabeculectomy with IGEN in controlling intraocular pressures in glaucoma patients.

Methods: A prospective series of 15 eyes of 12 patients who underwent trabeculectomy and phacoemulsification with trabeculectomy with IGEN implant between 1st September to 31st December 2010 was carried out. For each patient the following data were collected: pre operative IOP, number of glaucoma medications used, operation date, surgical technique, postoperative IOP, number of post operative medications and postoperative complications were recorded. A primary outcome measure of success was defined as complete (IOP of 21 mmHg or less) without anti-glaucoma medications and qualified (IOP 21 mmHg or less) with anti-glaucoma medications. A routine trabeculectomy using a fornix based conjunctival flap was performed in all cases. The sclera flap was closed with three loose 10-0 nylon sutures. The IGEN implant was placed on top of the sclera flap under the conjunctiva which was then closed with 10-0 nylon sutures. In those cases combined with phacoemulsification, a two site procedure was performed.

Results: Types of glaucoma: POAG: 9 eyes – CACG: 4 eyes – Secondary to chronic uveitis: 2 eyes – Eyes which underwent trabeculectomy and phacoemulsification (2 Site) procedure: 12 – Eyes for trabeculectomy alone: 3 – No of right eyes: 11 – No of left eyes: 4 – Mean Preoperative IOP: 25.50 ± 2.511 – Mean post operative IOP: at 1 day 16.83 ± 0.936 ; at 1 week 13.75 ± 1.115 ; at 1 month 15.55 ± 1.620 ; at 2 months 15.85 ± 1.778 . Two eyes had IOP of > 20 mmHg at 2 months and required one anti-glaucoma medication. Both are the eyes with glaucoma secondary to chronic uveitis. 1 eye had wound leakage which required resuturing 2 weeks post-operatively and subsequently required 1 anti-glaucoma medication to control the IOP. Two other eyes did not have any complications but required 1 anti-glaucoma medication to control the IOP 2 months postoperatively.

Conclusion: This study has demonstrated that the biodegradable collagen matrix (IGEN) was effective in improving the surgical success in eyes undergoing trabeculectomy alone and phacoemulsification combined with trabeculectomy (2-site procedure) in our small group of patients. Future randomized controlled studies should help to determine the place of biodegradable collagen matrix implants in trabeculectomies.

P562 INTERMEDIATE AND LONG-TERM RESULTS OF MITOMYCIN-C TRABECULECTOMY, AS A FIRST PROCEDURE, IN UVEITIC GLAUCOMA

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Purpose: To report the intermediate and long-term outcome of mitomycin C trabeculectomy (MMCT), as a first procedure, in uveitic glaucoma.

Design: Retrospective, non-comparative case series.

Participants: We included 70 eyes from 50 patients with uveitic glaucoma who underwent first time MMCT between 1992 and 2005 and had at least one year follow-up.

Methods: IOP ≤ 21 mmHg without and with medications were considered complete and qualified success respectively. IOP ≥ 21 mmHg with medications, need for further surgery or loss of vision resulting from surgery complications or poor glaucoma control was considered failure.

Main Outcome Measures: Intraocular pressure (IOP) con-

trol, number of glaucoma medications required, complications related to surgery and visual loss related to poor glaucoma control or surgery complications.

Results: The mean follow-up was 6.4 years. The cumulative probability of success was 80%, 61%, and 49% at 1, 3, and 5 years, respectively. Seventeen eyes (24%) underwent further glaucoma surgery.

Conclusion: IOP control with MMCT during the first year was good, but intermediate and late failure was common and further glaucoma surgery was frequently needed.

P563 EFFICACY OF DOUBLE INLAYS AMNIOTIC MEMBRANE TRANSPLANTATION IN TRABECULECTOMY

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Purpose: To determine the efficacy and safety of human preserved amniotic membrane in the trabeculectomy for treatment of primary open-angle glaucoma.

Subject and Method: A prospective randomized study to compare trabeculectomy with amniotic membrane (study group) versus trabeculectomy alone (control group) in the treatment of the primary open-angle glaucoma. Thirty patients with chronic open-angle glaucoma were divided randomly and equally into two groups. Patients were followed for one year to assess the intraocular pressure, number of glaucoma medications, bleb configuration and postoperative complications.

Result: The baselines mean intraocular pressure was 28 ± 2.3 mmHg (range 25 to 38 mmHg) in the study group and 29 ± 2.4 mmHg (range 26 to 39 mmHg) in the control group. At one year follow up, the mean postoperative intraocular pressure was 12.65 ± 2.64 mmHg in the study group and 15.30 ± 3.22 mmHg in the control group. The difference in intraocular pressure between groups was statistically insignificant ($p > 0.2$). Postoperative number of glaucoma medication showed a statistically significant reduction in both groups ($p < 0.002$ and $p < 0.008$, study and control group respectively). At the end of follow up period, ten eyes (66.67%) showed thin, avascular bleb in the study group as compared to only one eye (6.67%) in the control group. No postoperative complications were recorded in both groups.

Conclusion: Amniotic membrane transplantation may be effective and safe method to reduce the subconjunctival fibrosis and so increase the success rate of glaucoma filtering surgery.

P564 THE CORRELATION BETWEEN INTRAOPERATIVE AND EARLY POSTOPERATIVE INTRAOCULAR PRESSURE OF TRABECULECTOMY

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Purpose: To evaluate the effect of intraoperative intraocular pressure (IOP) during trabeculectomy on the early postoperative IOP.

Participants and Methods: we prospective included 100 patients with primary angle-closure glaucoma (PACG) and

open-angle glaucoma (POAG) treated by antimetabolites-augmented trabeculectomy. All participants received clinical examinations covered visual acuity, visual field, gonioscopy, and ophthalmoscopy before trabeculectomy. IOP were measured with Goldman applanation tonometer when scleral flap was fixed and anterior chamber was formed and stable during trabeculectomy, postoperative IOP was tested at post-operative day 1, 7 and 30.

Results: 100 patients were included in this study, with a mean age of 60.8 ± 9.9 years, 41 males (41%), 85 patients with PACG (85%). The mean deviation (MD) was -21.6 ± 9.2 , presenting visual acuity was 0.58 ± 0.47 and IOP was 28.4 ± 13.1 mmHg before surgery. There were 100, 94 and 82 patients sticking to the follow up at the 3 day-1, 7 and 30. The postoperative IOP at day 1, 7, 30 in eyes with intraoperative IOP ≤ 12 mmHg were 13.3 ± 7.3 , 10.9 ± 5.0 and 12.1 ± 3.6 , specifically, while in those with intraoperative IOP ≤ 12 mmHg were 16.9 ± 8.4 , 15.3 ± 11.2 and 14.7 ± 8.0 mmHg. The differences were significant between two groups ($p = 0.03$, 0.01 and 0.05). Linear regression analysis revealed that intraoperative IOP was a significant factor affecting the IOPs on day-1 ($r = 0.32$, $p < 0.01$, $R^2 = 0.11$), day-7 ($r = 0.58$, $p < 0.01$, $R^2 = 0.29$) and day-30 ($r = 0.25$, $p < 0.01$, $R^2 = 0.11$).

Conclusions: Intraoperative IOP has a notable effect on early postoperative IOP after trabeculectomy. Our results suggested the possibility of quantitative control of IOP during the procedures that permits better postoperative IOP control.

P565 LEARNING TRABECULECTOMY. INITIALS RESULTS OF A SINGLE SURGEON

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Background: Trabeculectomy surgery is a preferred surgical procedure for the treatment of glaucoma. Trabeculectomy surgery has a learning curve and the trainee surgeon has to master the steps to achieve surgical success.

Aim: To present and analyze the surgical results of initial trabeculectomies performed by a single trainee surgeon.

Material and Methods: A retrospective surgical audit of the first 50 trabeculectomy surgeries of a single glaucoma fellow-ship trained surgeon. Main outcome measures included were IOP control and complications.

Results: The study included 50 eyes of 50 patients, 34 male and 16 female. Success was defined as intraocular pressure between 6 and 21 mmHg at 6 weeks post surgery without medicines. The success rate in this study was 92%. Limbus based conjunctival peritomy was done in all patients. Antimetabolites were used in all patients. Releasable sutures were used in all patients. Removal of releasable sutures was done in 32 patients during the post-operative period. One patient was noted to have hypotony at last follow-up.

Conclusions: Trabeculectomy is a safe and effective procedure when done by trained surgeons. The patient requires adequate follow up and if required, intervention is necessary to ensure success of the surgery.

P566 INCISIONAL GLAUCOMA SURGERY (TRABECULECTOMY) DECREASES THE RATES OF LOCALIZED AND GLOBAL VISUAL FIELD PROGRESSION IN PRIMARY OPEN-ANGLE GLAUCOMA IN THE SUB-HIMALAYAN GANGETIC PLAIN OF INDIA

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Purpose: Incisional glaucoma surgical procedures (trabeculectomy) produce greater intraocular pressure (IOP) reduction and less IOP variability than medical treatment. The flatter diurnal curve, the easy approach and greater predictability make it a sought after treatment of choice in the poorer section of the community in the sub-Himalayan Gangetic plane. We tried to determine the efficacy of glaucoma surgery in decreasing localized and global rates of visual field (VF) progression.

Design: Retrospective, Interventional Case- Series.

Participants: Patients, attending the Glaucoma Clinics of Disha Eye Hospitals, Barrackpore, West-Bengal India, and Ramakrishna Mission Seva Pratishthan, Kolkata, West-Bengal, India with glaucomatous optic neuropathy, repeatable and demonstrable VF loss, and 8 or more Swedish interactive threshold algorithm (SITA) standard VF examinations were assessed for eligibility. Patients who underwent successful glaucoma surgery (not requiring further surgical intervention and IOP < 18 mmHg) in either eye and who were followed up for at least 2 years before and after surgery were enrolled. Automated point-wise linear regression analysis was used to calculate global and localized rates of progression before and after surgery. Eyes with other ocular conditions likely to affect the VF and an insufficient number of VF to create a slope before and after surgery were excluded. Comparisons were performed within the same eyes before and after surgery (student paired t test).

Results: We enrolled 42 eyes of 42 patients (mean age, 59.4 ± 12.7 years). The estimated mean number \pm standard deviation of VF was 10.4 ± 2.4 , spanning 6.1 ± 1.1 years (range, 5 to 7 years). Mean IOP \pm standard deviation decreased from 26.2 ± 5.6 mmHg before surgery to 12.3 ± 3.6 mmHg after surgery (40% reduction; $p < .01$). Mean global progression rates decreased from -2.37 ± 1.4 dB/year before surgery to -0.39 ± 0.7 dB/year after surgery (70% reduction; $p = .01$). Nineteen eyes (45.3%) had at least 1 significantly progressing point before surgery, whereas only 3 (7.14%) had at least 1 progressing point after surgery. Each 1 mmHg of IOP reduction after surgery resulted in a 0.12 dB/year decrease in the global rate of progression.

Conclusions: Our study shows that successful IOP reduction after glaucoma surgery greatly reduces both the number of progressing points and the localized and general rates of VF progression. Therefore it is much more predictable and approachable treatment for poor patients having primary open-angle glaucoma in the Sub-Himalayan gangetic plane.

P567 SAFETY AND EFFICACY OF OLOGEN™ IMPLANT AND ADJUNCTIVE MITOMYCIN C IN TRABECULECTOMY IN ASIAN INDIAN EYES WITH ADVANCED GLAUCOMA

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Background: The aim of this study was to assess the safety and efficacy of a biodegradable collagen implant (Ologen™ implant) with adjunctive mitomycin C (MMC) during trabecu-

lectomy in Asian Indian eyes with medically uncontrolled, advanced glaucoma.

Methods: in this prospective non-comparative trial, 16 eyes with advanced glaucoma underwent standard Cairn's trabeculectomy using releasable sutures and intra-operative sub-Tenon's application of 0.2 MMC for 1 minute. The implant was placed on top of the scleral flap after it was closed and the conjunctival flap was sutured in a watertight manner. We defined advanced glaucoma in an eye with medically uncontrolled intraocular pressure (IOP) and visual fields with mean deviation of > -20 Db and corresponding optic nerve changes. 7 patients had glaucoma secondary to uveitis, 2 patients had juvenile glaucoma and 9 had primary open-angle glaucoma (POAG); 7 of these patients were high myopes and 2 had had a failed trabeculectomy in the past. Minimum period of follow up was 3 months (range 3 to 15 months, average 6.3 months). Follow up examinations included testing of visual acuity, IOP and detailed ocular examination.

Results: Mean preoperative IOP was 33.9 ± 8.6 mmHg (95% CI, 29.3 to 38.5) for all patients enrolled. Mean IOP following surgery at final visit was 10.1 mmHg ± 3.5 mmHg (95% CI 8.2 to 11.9); this decrease in IOP was statistically significant ($p < 0.0001$). Average number of medications prior to surgery was 2.7 ± 1.0 , including systemic acetazolamide in 5 patients. Post operatively, only 2 patients required a single medication for control of IOP ($p < 0.0001$). None of the patients required any additional procedures post operatively for control of IOP. Scleral sutures were released in only 4 of the patients. 2 patients had transient hypotony (IOP < 6.0 mmHg) that was managed conservatively. Visual acuity remained stable in all patients.

Conclusion: Collagen implants (Ologen™) appear to be safe and effective when used with low dose MMC in eyes undergoing trabeculectomy with advanced glaucoma and requiring low target IOP, where the risk of hypotony with higher concentrations of MMC is high.

P568 WIPING TEARS OF WEEPING BLEBS!!!

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Video: This video shows various medical and surgical modalities of management of early and late leaking blebs. Drug therapy includes atropine, aqueous suppressants (topical β blockers and oral acetazolamide). Temporary tamponade by simple pressure patching is a fairly successful method. Large diameter soft bandage contact lens may be tried. Subconjunctival autologous blood injection with compression sutures often helps. Resuturing of conjunctival/scleral flap or Conjunctival advancement to hood existing bleb or free conjunctival autograft patch are also effective. Amniotic membrane transplantation (AMT) to cover defects is quite successful. Donor scleral patch graft or other patch grafts may be used. Finally a new innovative technique of autologous scleral patch repositioning is also shown here.

P569 THE OUTCOME OF TRABECULECTOMY USING A COLLAGEN MATRIX IMPLANT (OLOGEN)

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Purpose: To assess the outcome of trabeculectomy with the use of a collagen matrix implant (Ologen).

Methods: This study involved a retrospective chart review of patients who had had trabeculectomy using a collagen matrix implant (Ologen) with a follow-up period of at least 3 months. Variables including demographics, type of glaucoma, IOP level before and after surgery, number of glaucoma medications before and after surgery as well as complications will be recorded and analyzed.

Results: 17 eyes of 16 patients were enrolled in this study. Mean age was 54.5 years. With success defined as intraocular pressure (IOP) < 21 mmHg and at least a 20% reduction from baseline on the same or fewer number of preoperative medications, 15 out of 17 (88%) eyes fit these criteria over the entire course of follow-up. The percentage of patients requiring 2 or more medications declined from 100% preoperatively to 18% at 3 months postoperatively ($p < .01$). Patients who did not meet the criteria of success regained successful IOP control with other modalities of management. Complications were few and included hypotony in two eyes that were treated conservatively.

Conclusion: We believe that the use of a collagen matrix implant (Ologen) offers a safe effective way to improve the outcome of filtration surgery.

P570 MINIMUM SURGICAL DRAINAGE OF SUPRACHOROIDAL FLUID FOLLOWING GLAUCOMA SURGERY

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Background: To report the injection of Balanced Salt Solution (BSS) into vitreous cavity as a surgical drainage for suprachoroidal fluid following glaucoma surgery.

Methods: The BSS was injected into the vitreous cavity to increase the IOP to about 40 to 50 mmHg in the quadrant where the detachment was largest. Yellow fluid leaked through the injection site following removing the 27G needle. With slowly pressurizing the eye with BSS at the second intravitreal injection in the desired quadrant, rapid drainage of the flavous suprachoroidal fluid from the first puncture site was achieved.

Results: With injection of BSS into the vitreous cavity, four patients with a long-standing hypotony and serous choroidal detachment were successfully managed.

Conclusion: Intravitreal injection of BSS is a minimum, inexpensive and efficacious remedy for surgical drainage of serous choroidal detachment.

Key Words: Intravitreal injection; Balanced salt solution; Choroidal detachment; Glaucoma surgery.

P571 THE EFFICACY OF NEEDLE REVISION OF FAILED FILTERING BLEBS AFTER TRABECULECTOMY USING 5- FLUOROURACIL

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Purpose: To evaluate a surgical technique to revise a failed filtering bleb using subconjunctival 5-Fluorouracil after primary trabeculectomy.

Patients and Methods: This study is a prospective, serial

case of the outcome of 21 Glaucoma patients with 22 eyes that had undergone needling revision for failed trabeculectomy from 4/2009 to 4/2010. All surgery was performed in the operating room by an experience glaucoma surgeon, 5-Fluorouracil (0.1 mL; 50 mg/ml) was injected into and around the bleb. A 30-gauge needle was used to lyse subconjunctival fibrosis and episcleral scar tissue binding down the scleral flap, and elevate the scleral flap. The mean intervening time between original trabeculectomy and the needling procedure is 3.72 ± 2.96 months. The main outcome measurements were IOP and number of glaucoma medications, number of further surgery as well. A successful outcome was defined as a maximum IOP of 18 mmHg without medications, and follow-up of 1 day, 1 week, 1, 3 and 6 months. Failure was defined as IOP ≥ 18 mmHg with or without anti-glaucomatous medication.

Results: 52% of patients achieved success after one revision with follow-up of 6 months. In successful cases, the mean IOP decreased from 31.04 ± 10.33 mmHg to 17.33 ± 6 mmHg (6 tháng). Kaplan-Meier survival analysis calculated a success of 91% at 1 week, 73% at 1 month, 68% at 3 months, and 52% at 6 months.

Conclusions: In failed filtering blebs, needle revision with 5-Fluorouracil approach results in high success and low complication rates, an effective method to control IOP and avoid further surgery in a high proportion of patients with medically uncontrolled non-filtering blebs.

P572 CLINICAL OBSERVATION OF UVEOSCLERAL DRAINAGE SURGERY ON GLAUCOMA PATIENTS

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Objective: to evaluate the safety and effectiveness of a novel anti-glaucoma surgery which we termed as uveoscleral drainage surgery.

Method: we had a retrospective study of 78 eyes (57 patients) indicated for glaucoma surgery. 46 eyes had uveoscleral drainage surgery as experimental group and 32 eyes had standard trabeculectomy as controlled group. In experimental eyes, a longitudinal block of tissue (about 1.5 mm \times 5 mm) including trabecular meshwork and deep sclera was cut off beneath a triangular scleral flap (about 5 mm \times 5 mm). No anti-metabolics or adjustable suture was used in any of the eyes. Success was termed as IOP ≤ 21 mmHg without medication.

Results: There was no significant difference in intraocular pressure (IOP) on first visit, before surgery and 10 days after surgery between two groups. The following time was 4 ~ 162 (average 71.57 ± 47.7) months in the experimental group and 3 ~ 24 (average 13.21 ± 5.67) months in control group. IOP at the last follow-up was 10.24 ~ 26.56 (average 15.79 ± 2.42) mmHg in experimental group and 14.57 ~ 28.97 (average 20.55 ± 3.20) mmHg in control group. The difference was significant. The success rate was 84.78% in experimental group and 50% in control group ($p \leq 0.01$). The incidence of shallow anterior chamber was significantly lower in experimental group. No serious complication occurred in experimental group.

Conclusion: Uveoscleral drainage surgery was a safe and effective anti-glaucoma surgery. Compared with trabeculectomy, it may be better in long-term IOP control.

P573 SUBCONJUNCTIVAL BEVACIZUMAB IN THE FILTERED EYE AT HIGH RISK OF FAILURE. A CASE SERIES

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Background: Neutralization of VEGF by means of bevacizumab, which reduces vascularity and decreases scar formation around the scleral flap, has already been used in subconjunctival administration in trabeculectomy. The aim of this study was to assess the effect of subconjunctival application of bevacizumab in operated glaucomatous eyes which had already received other adjunct measures and still show signs of high risk of failure.

Methods: Design of the study: prospective case series. Eyes which had undergone trabeculectomy and that in spite of healing modulation/bleb rescue procedures continued under high risk of failure (elevated IOP and/or other signs such as increased vascularity with corkscrew vessels) were submitted to subconjunctival injection of bevacizumab, 125 mg. When considered necessary, injection was preceded by a needling procedure. Regular examinations including funduscopy, tonometry and biomicroscopy were made. Main outcome measures: glaucoma diagnoses, mean age at procedure, modulation/bleb rescue measures, mean previous IOP, mean IOP at the time of bevacizumab injection and at the end of follow-up, bleb grading (Moorfields scale) at the time of injection and at the end of follow-up.

Results: Twenty-two eyes of twenty-one patients met the inclusion criteria. Mean age was 54.3 years. Diagnoses were POAG (6 cases), Pseudoexfoliation-associated Glaucoma (5 cases), PCAG (5 cases), Juvenile Glaucoma (3 cases), Post-surgical Glaucoma (2 cases) and Steroid-induced Glaucoma (1 case). Average preoperative cup/disc ratio was 0.89 ± 0.09 (range 0.8 to 1, median 0.9). Mean pre surgical IOP was 34.6 ± 13.5 mmHg. Average time between surgery and the injection of bevacizumab was 34.85 days (range 11 to 210, median 25 days). All eyes had undergone adjunctive intra-operative and/or postoperative modulation measures and/or bleb rescue procedures and were under glaucoma therapy at the time of bevacizumab administration. These measures included application of 5-FU (28), of MMC (3), needling procedures (3), surgical revision (3) and reoperation (1). Mean follow-up after subconjunctival bevacizumab injection was 352.13 ± 142.3 days (median 353 days). Mean IOP at the last control was 12.86 ± 3.75 mmHg (range: 7 to 21, median 12.5), meaning an average reduction of 25.13% from IOP values at time of injection. The size of the central part of the bleb as well as the total filtering area and the bleb height increased slightly but the difference was not statistically significant. Vascularity decreased an average of 1.74 scales in Moorfields grading system ($p = 0.005$). There were no complications related to the subconjunctival injection.

Conclusions: All eyes had functioning blebs with satisfactory IOP at the last control. This is remarkable in a series of advanced glaucomatous eyes which were at high risk of failure at the time of the injection. Changes in the aspect of the blebs have been observed after bevacizumab injections; this finding should be confirmed in controlled trials. Bevacizumab may be used as an adjunctive measure in trabeculectomy in eyes which have undergone other previous procedures and continue being at high risk of failure.

P574 NON-PENETRATING GLAUCOMA SURGERY AND EXPRESS SHUNT – ONE MORE OPTION

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Background: Non-penetrating surgery is a method of choice in primary open-angle glaucoma. In the last few years many modifications using implants has been demonstrated. The goal of the different implants is to maintain the ostia and the Schlemm's canal open (tension suture-canaloplasty, t-flux, etc.). One of the popular implants used in penetrating surgery is ExPRESS shunt (Alcon Laboratories). Alternative application of this shunt into the ostia of the Schlemm's canal preserves from collapse of the canal in long term period.

Methods: Five uncontrolled open-angle glaucoma patients were referred for non-penetrating procedures following ExPRESS shunt implantation into the Schlemm's canal. Patients underwent complete ophthalmologic evaluation and were appropriately managed. One glaucoma specialist (IT) performed all procedures. Outcome measures included intraocular pressure (IOP), complications, and additional medications. Failure was defined as unacceptably high IOP requiring revision or explantation.

Results: Obtained intraocular pressure has been presented on 1 post-op day, 2 weeks, 1 month, 3 months, 6 months and 8 months. During the postoperative period no additional hypotensive medication was used. Obtained intraocular pressure was stable within 8 months period.

Conclusions: Application of the ExPRESS shunt into the Schlemm's canal in term of non-penetrating procedure preserved collapsing of the ostia in long term period. This modification maintains the advantages of non-penetrating procedures.

P575 MODIFIED PENETRATING TRABECULECTOMY WITH A NEW MEMBRANE PUNCH AND NO IRIDECTOMY – AN AUDIT

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Purpose: A further audit and description of this technique, first described in Ocular Surgery News (U.S. May 05 / Europe April 06) to demonstrate the relative technical ease and reproducibility of the surgery and to show its effectiveness.

Setting: This audit is of a group of trabeculectomy patients treated at Birch Hill Hospital, Rochdale, U.K. during the period 2003-2004.

Methods: 19 eyes of 18 patients including 6 phaco-trabeculectomies and 2 pseudo-phakic eyes had a modified trabeculectomy. The technique involves a fornix based flap. Application of Mitomycin C. A guarded 300 micron incision parallel to and 1.5 mm from the blue line. A spoon dissection 2.5 mm forwards. A keratome entry to the anterior chamber. Introduction of chondroitin sulphate to the anterior chamber. The use of the Jacobs punch through the scleral tunnel. This is available from Duckworth and Kent and a one-use version coming out soon, from Malosa. No iridectomy. No scleral sutures. Conjunctival closure.

Results: The results from this audit at twelve months were compared to the U.K. national survey of trabeculectomy. This

showed the results of 1,240 patients treated by consultants in the NHS, followed for 12 months. Results will be given in the order modified trabeculectomy audit first, national survey second: Pre-operative intra-ocular pressures were 23 – 26.2. Post-operative intra-ocular pressures at 12 months were 12.3 – 14.4.

A reduction respectively of 53.4% and 54.9%. Final intra-ocular pressure, including those on glaucoma drops, was equal or less than 21 in 100% – 92%.

Conclusions: The results of this and an earlier (Ocular Surgery News) audit confirm that this technique shows good results. It has the advantage of being quick, reproducible and easily mastered. It is suitable for cases with a healthy iris and a deep peripheral anterior chamber including plateau iris.

Surgical Treatment: Short-Tube Shunts to Aid External Filtration

P576 A NEW STAINLESS STEEL WIRE GLAUCOMA DEVICE IN SURGICAL MANAGEMENT OF REFRACTORY GLAUCOMA

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Background: Refractory glaucomas are difficult to treat. Traditional filtering procedures are less effective. In most of the cases the painful eyeball is subjected to either evisceration or enucleation. Different drainage devices like Krupin-Denver valve implant, Molteno implants, Ahmed glaucoma valves, Baerveldt seton and Schocket shunt have been proposed. Severe hypony, shallow anterior chamber (AC), suprachoroidal hemorrhage, blockage of inner lumen of the device, need for surgical revision, drainage exposure and formation of cystic blebs are some of the reported complications of these devices.

Aim: To evaluate safety and effectiveness of a new glaucoma device in surgical treatment of refractive glaucoma.

Methods: The study was undertaken under the innovative educational program of the Russian people's friendship university. A total of 41 patients (22 male and 19 females) with an average age of 68.6 ± 7.1 years (range: 55 – 79 yrs.), who were referred and admitted to the hospital for evisceration of eye ball for painful absolute glaucoma were selected and operated upon.

Surgical technique: Glaucoma device was made by winding 250 micron thick surgical grade steel wire on a 2.5 mm wide and 0.5 mm thick metallic spatula. A fornix based conjunctival flap was prepared superiorly or at an appropriate site. Approximately 1.0 to 1.5 mm away from limbus, a scleral groove (1.0 X 0.5 mm X 90-95% full sclera thickness) was created by ablating the scleral tissue with Fugo plasma blade. At the base of this groove 1.0 -1.5 mm wide parasynthesis was made into AC with a diamond or metallic knife. Glaucoma device was entered into AC and its other end was fixed to the posterior lip of scleral groove with a 10-0 nylon suture. Conjunctival flap was fixed to limbus with interrupted 10-0 sutures. Main outcome measures were IOP changes, complication rate, additional glaucoma medication and need for

surgical revision. Criteria for success were relief from pain, normal outlook of the eye ball, decrease in preoperative IOP by 30% or more with or without glaucoma medication. Follow up: the patients were followed up from 3 to 12 months.

Results: In 97.5% cases (40 patients) eye was saved as an organ. Thirty four patients (82.9%) got relief from pain. After surgery IOP was controlled in 28 patients (73.7%), other patients required additional glaucoma medication. Mean IOP decrease was 17.7 ± 2.5 mmHg (53% decrease, $p < 0.05$). After 1 year 7 cases (17.1%) had high IOP, which was controlled with glaucoma medication and in 3 cases repeat surgery was required.

Conclusion: Long terms results showed that implantation of stainless steel wire glaucoma device is technically simple and safe to perform; it effectively controls IOP in cases of refractory glaucoma.

P577 MINIATURE EX-PRESS GLAUCOMA DEVICE IMPLANTATION – A RETROSPECTIVE CASE SERIES

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Background: During the past years, Ex-Press operations are growing in popularity among glaucoma surgeons all over the world. We hereby present our experience with these Ex-press devices at our department.

Methods: In our department 40 Ex-Press implantations were performed in 36 glaucoma patients from June 2008 to October 2010. A retrospective chart review was made and a statistical analysis was done. The patients were then divided according to the glaucoma type: Primary open-angle glaucoma, neovascular glaucoma, pseudoexfoliation glaucoma and uveitic glaucoma.

Results: Average follow-up time was 8.9 months (range 0.3-24.9). Thirty-six patients (40 eyes) underwent Ex-Press implantation. The age range was 41-90 years (Avg. 74 years). Thirty-two patients (90%) underwent Ex-Press procedure in one eye, and 4 patients (10%) in both eyes. *Pre-operative data:* Eighteen patients (45%) had an intraocular pressure (IOP) between 21-30 mmHg, 11 (27.5%) had between 31-40 mmHg, and 7 (17.5%) had an IOP more than 41 mmHg. All were pseudophakic. Twenty-two (55%) had POAG, 8 (20%) had PXG, 8 (20%) had NVG and 2 (5%) had uveitic glaucoma. Average pre-op cup-to-disc ratio was 0.82. In 5 patients (12%) the operation was made in their only-eye. Half of the patients had the Ex-Press operation as a primary glaucoma operation. The average number of anti-glaucoma medications was 3.28 per patient where the maximum was 5 medications per patients. Sixteen Eyes (40%) were treated with eye-drops only, 12 eyes (30%) both with medications and previous surgery and 6 eyes (15%) both with medications and a prior laser treatment. In 77% of the patients a severe worsening of the visual field was noted on pre-op exam. *Intra-operative:* Most (90%) of the patients didn't require an additional intra-operative intervention, and 4 patients (10%) did. *Post-operative data:* The average change in BCVA was of logMAR = 0.23, where 12 patients had improved BCVA, 19 had worsened and 9 had unchanged BCVA. One patient developed posterior capsular opacity. Ten patients (25%) required an additional surgical intervention due to closure and dysfunction of the tube: 2 (5%) had Ex-Press extraction, 3 (7.5%) underwent a second ex-press procedure and 5

(12.5%) underwent trabeculectomy. The average IOP was 18 mmHg (range: 4-45), with an averaged decrease in IOP of 13 mmHg (-31 ± 10 mmHg) and most patients (30/40, 75%) had IOP in the normal range (up to 20 mmHg). Only 23 patients (57.5%) required an additional anti-glaucoma medication. There was an averaged decrease of 1.78 medications per patient, when the maximal decrease was of 5 medications per patient. In fact, for over one third of the patients (14/40, 35%), the Ex-Press was a definite procedure without any other treatments needed post-op.

Conclusion: Our results show a decrease in the IOP with a single procedure, an overall decrease in the number of anti-glaucoma medications. More than one third of the patients did not require any additional medications. Moreover, a relative low percentage of complications was noted. However, the procedure did not prevent the natural deterioration of BCVA due to the glaucoma.

P578 EX-PRESS MINIATURE GLAUCOMA IMPLANT IN ADVANCED GLAUCOMA CASES

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Purpose: To report results of implantation of the Ex-PRESS Miniature Glaucoma Implant shunt under the scleral flap in advanced glaucoma.

Methods: Chart review of nine cases of Ex-PRESS implantation. Outcome measures included intraocular pressure (IOP), complications, visual acuity, and additional interventions. Failure was defined as unacceptably high IOP requiring revision or explantation.

Results: Two patients (22.2%) failed. Three (33.3%) experienced hypotony during postoperative week one. In the seven non-failures, mean pre and postoperative IOPs were 30.1 ± 6.7 mmHg and 12.3 ± 3.7 mmHg, respectively ($p = .006$). The visual acuity did not change significantly. There were no intraoperative complications. Postoperative complications in the ohne eye included choroidal detachment in 2 (22.2%) and suprachoroidal hemorrhage in 1 (11.1%). Of the 7 successful cases, additional interventions were required in 1 (11.1%).

Conclusions: Despite significant IOP reduction, the incidence of complications following Ex-PRESS implantation under sclera flap was acceptably in this group of patients.

P579 EX-PRESS GLAUCOMA FILTRATION DEVICE EFFECTIVENESS THREE YEARS AFTER SURGERY IN PRIMARY OPEN-ANGLE GLAUCOMA

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Background: Superior intraocular pressure (IOP) reduction and the reduced IOP lowering drug utilization rate of the EX-PRESS glaucoma filtration device (Alcon Inc., TX) in comparison to standard trabeculectomy were reported in primary open-angle glaucoma (POAG) patients at one year, by de Jong (Advanced Therapeutics. 2009; 26: 336-45). The objective of this subsequent investigation is to determine whether the findings persisted 3 years after surgery.

Methods: This was a prospective randomized clinical trial,

performed in one center by a single surgeon (LDJ) and included patients that had POAG and couldn't be controlled with maximal-tolerated medical therapy. Randomization allocated patients either to EX-PRESS or standard trabeculectomy. Surgery was carried out under topical anesthesia and EX-PRESS was implanted under a scleral flap. Patients were followed-up annually. Outcomes included IOP, IOP lowering drug prescriptions and glaucoma surgeries. The statistical unit was the operated eye. Patients were defined as success if they met 3 requirements: IOP less than a threshold (15 or 18 mmHg), no prescriptions for an IOP lowering drug, no subsequent glaucoma surgery. Comparisons at fixed visits were assessed with either a Student t-test or a chi-square test. Time to failure was analyzed using survival curves and a log rank test. All tests were interpreted at 5%, two-sided.

Results: 78 patients were analyzed, 39 in each arm. At one year, IOP was reduced from 22.8 to 12.0 mmHg with EX-PRESS and from 21.3 to 13.9 mmHg with trabeculectomy. Patients treated with EX-PRESS were more likely to reach an IOP target of either 18 mmHg or 15 mmHg without the prescription of an IOP lowering drug and without additional glaucoma surgery. When the IOP threshold was fixed at 18 mmHg, success rates were 87%, 77% and 67% at 1, 2 and 3 year respectively for EX-PRESS treated eye and 51%, 46% and 38% for eyes having had standard trabeculectomy. The results became 79%, 69% and 64% for EX-PRESS and 41%, 36% and 31% for trabeculectomy, when the IOP threshold was fixed at 15 mmHg. At year 3, 33.3% of the EX-PRESS patients had an IOP lowering drug prescription versus 53.9% for the trabeculectomy patients. At year 3, EX-PRESS patients received 0.62 IOP lowering medications versus 1.28 in the trabeculectomy group. EX-PRESS patients required less needling (2 versus 6) and had fewer cataract surgeries (5 versus 8). Other reported post-operative interventions and complications were similar for each group.

Conclusions: Better IOP control with the EX-PRESS glaucoma filtration device was observed 3 years post surgery compared to standard trabeculectomy. Three years after surgery, EX-PRESS patients experienced more therapeutic successes, less IOP lowering drug use, and fewer follow-up glaucoma surgeries. Economic consequences of reduce reduced consumption and better outcomes need to be evaluated.

P580 CHANGES IN ANTERIOR SEGMENT PARAMETERS FOLLOWING INSERTION OF EX-PRESS MINIATURE GLAUCOMA IMPLANT

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Background: The purpose of our study was to evaluate the effect of Ex-PRESS Miniature Glaucoma Implant surgery on corneal curvature and anterior segment parameters obtained with the Pentacam rotating Scheimpflug camera (Oculus inc.).

Methods: A total of 13 eyes of 13 consecutive patients (8 men, 5 women) were evaluated pre-operatively, on the first postoperative day and 3 months postoperatively with the Pentacam. We compared measurements of anterior and posterior corneal curvature, anterior and posterior corneal astigmatism, anterior chamber depth (ACD), anterior chamber

volume (ACV) and anterior chamber angle (ACA) before and after surgery. All study eyes were pseudophakic.

Results: IOP decreased significantly from 33.2 ± 11.2 mmHg pre-operatively to 5.9 ± 5.1 mmHg on the first postoperative day ($p < 0.0001$) and 18 ± 6 mmHg at 3 months following surgery ($p = 0.0002$). On the first post-operative day the anterior corneal astigmatism increased from 2.3 ± 1.3 D to 3.7 ± 2 D ($p = 0.04$); the posterior corneal astigmatism increased from 0.5 ± 0.2 D to 0.9 ± 0.6 D ($p = 0.03$); the ACD decreased from 4.3 ± 0.9 mm to 3.5 ± 1.1 mm ($p = 0.05$) and the ACV decreased from 197.9 ± 40.5 to 166.8 ± 50 mm³ ($p = 0.09$). All of these changes in anterior segment parameters were not statistically significant at 3 months after surgery.

Conclusions: Ex-PRESS Miniature Glaucoma Implant surgery significantly decreased IOP, and had a transient effect on anterior segment parameters. Corneal curvatures, ACD, ACV, and ACA were not affected at 3 months follow up.

P581 DYNAMICS OF THE QUANTITATIVE ANTERIOR CHAMBER PARAMETERS IN EYES WITH EX-PRESS MINIATURE GLAUCOMA SHUNT VERSUS STANDARD TRABECULECTOMY

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Purpose: To compare the dynamics of the anterior chamber (AC) parameters (depth, cameralar angle, volume) in eyes with Ex-PRESSTM miniature glaucoma shunt versus standard trabeculectomy, during the immediate postoperative period.

Setting: Private practice, Iasi, Romania.

Methods: This prospective, observational study comprised eyes with Open-angle glaucoma (OAG) that had uncomplicated glaucoma surgery: 20 eyes with Ex-PRESSTM miniature glaucoma shunt and 20 matched control eyes with standard trabeculectomy. The AC parameters (depth, cameralar angle, volume) were determined preoperatively, 1, 3, 7, 14 and 42 days postoperatively using the Pentacam technology.

Results: In the Ex-PRESSTM group, preoperatively, the mean AC depth, angle and volume were 3.76 ± 0.29 (SD) mm, 38.8 ± 2.12 (SD) ° and 198 ± 18 (SD) mm³, respectively. All the AC parameters reached the lowest values on day 3 postoperatively. On day 7, the AC parameters reached 80% from their preoperative values: 3.26 ± 0.33 (SD) mm, 32.8 ± 2.77 (SD) ° and 172 ± 18 (SD) mm³, respectively. The AC continued to deepen; on day 14 postoperatively, all the AC parameters reached approximately 95% from their preoperative values. In the trabeculectomy group, preoperatively, the mean AC depth, angle and volume were 3.81 ± 0.39 (SD) mm, 39.0 ± 2.9 (SD) ° and 198 ± 18 (SD), respectively. All the AC parameters reached the lowest values on day 1 postoperatively. On day 7, the AC parameters reached 60% from their preoperative values 2.81 ± 0.5 (SD) mm, 26.0 ± 4.5 (SD) ° and 118 ± 25 (SD) mm³, respectively. On day 14 postoperatively, the AC parameters reached approximately 80% from their preoperative values. The values of the AC parameters were significantly greater on day 7 postoperatively in the Ex-PRESSTM group versus the trabeculectomy group ($p < .05$).

Conclusion: The anterior chamber parameters return to normal faster after the implantation of the Ex-PRESSTM miniature glaucoma shunt compared with standard trabeculectomy.

tomy. These observations suggest that a faster reformation of the anterior chamber would lead to a more efficient filtration bleb.

P582 MIDTERM FOLLOW-UP OUTCOMES OF EX-PRESS MINI GLAUCOMA SHUNT IMPLANTATION IN PATIENTS WITH GLAUCOMA

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Background: To evaluate the efficacy of Ex-PRESS Mini Glaucoma Shunt Implantation in glaucoma cases due to variable etiologies.

Methods: Twenty six patients with various glaucoma types, in whom Ex-PRESS Mini Glaucoma Shunt was implanted, were evaluated retrospectively. All surgeries except two were performed under local anesthesia by the same surgeon. Shunts were implanted under partial thickness scleral flap and **5-Fluorouracil (5-FU)** was applied intraoperatively. Combined cataract-glaucoma procedure was undertaken in four cases. The preoperative and postoperative intraocular pressure (IOP), the number of anti-glaucomatous drugs being used and postoperative complications were noted. Success was defined as IOP under 21 mmHg after surgery with or without drugs.

Results: Mean age of the patients was 57.9 ± 20.34 (10-80) years. Twelve of the operations were performed on the left side and the other fourteen on the right side. Mean follow-up time was 9.8 ± 6.5 (4-24) months. Underlying etiology of glaucoma was as follows; four primary open angle, six pseudo-exfoliative, two uveitic, seven neovascular and seven post-penetrating keratoplasty glaucoma. The overall success rate was 85%. IOP decreased from 29.5 ± 11.7 (11-57) to 15.5 ± 7 (8-30) mmHg. The anti-glaucomatous drugs being used decreased from 2.8 to 0.7. In the early postoperative period choroidal effusion in four cases, hyphema in two cases and hypotony in one case were experienced. In four patients bleb needling was required to lower IOP. In four cases (15% failure) IOP could not be controlled despite anti-glaucomatous drugs after surgery.

Conclusion: Based on our midterm results, Ex-PRESS mini glaucoma shunt implantation may be successful in different types of refractory glaucoma.

P583 SUCCESS OF INTRAOCULAR PRESSURE CONTROL IN PATIENTS UNDERGOING EX-PRESS GLAUCOMA DEVICE IMPLANTATION WITH AND WITHOUT CATARACT EXTRACTION

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Background: This study evaluated the effectiveness and rate of complications of the Ex-PRESS Mini Glaucoma Shunt in reducing IOP when performed with cataract surgery or alone. The stainless steel non-valved device, available in two lumen sizes was implanted in patients with uncontrolled glaucoma exhibiting failure of control on medications, laser or progression of disease on medication alone.

Methods: This retrospective study was conducted at Pin-

nacle Eye Center, Howard University Hospital, and the Glaucoma Associates of Texas. A chart review of consecutive eyes having undergone Ex-PRESS Mini Glaucoma Shunt implantation from January 2008 to December 2008 was performed. Data analysis was performed using SPSS software version 17. The following preoperative data were recorded: best corrected visual acuity, IOP, number of preoperative glaucoma medications, history of prior glaucoma laser or incisional surgery. Additional data included cup to disc ratio, mean and pattern standard deviation from Humphrey SITA visual fields. Operative data including surgeon, technique, size of shunt, use of antimetabolites, and occurrence of complications were also recorded. Postoperative data collection included IOP measured and number of eye medications recorded at day 1, week 1 and months 1, 3, 6, 9 and 12. The number of medications required to control pressure was also recorded at each time point. Success was deemed as IOP < 18 mmHg. Failure was defined as eyes that required re-operation for glaucoma. A total of 180 eyes of 174 consecutive patient records were reviewed. There were 59 % female (n = 102) and 41% male patients (n = 72). The mean age was 71 years. All surgeries were performed by a single surgeon at each center with use of Mitomycin C and placement of the shunt under a partial thickness sclera flap. Forty-eight eyes underwent combined cataract extraction with Ex-PRESS implantation and 126 eyes had Ex-PRESS implantation alone. Average preoperative IOP was 23 mmHg for all eyes.

Results: The average postoperative IOP for eyes undergoing cataract and Ex-PRESS was 13 mmHg and 12 mmHg in the Ex-PRESS only group at postoperative day 1; 11 mmHg for both groups at postoperative day 7; 13 for both groups at the 6,9, and 12 month time points. The Number of patients achieving pressures below 18 with and without additional medications was noted. The groups were also analyzed comparing the data with Ex-PRESS implantation alone and the data with cataract surgery and Ex-PRESS implantation. There were few complications with 4 eyes experiencing worsening of cataract, 3 bleb leaks, 4 subsequent bleb revisions, 3 subsequent Baerveldt aqueous tube shunts.

Conclusion: In this series, implantation of Ex-PRESS mini shunt was effective and safe with control of IOP as long as 12 months following the procedure when performed with cataract extraction and alone.

Surgical Treatment: Long-Tube Shunts To An External Reservoir

P584 THE ROLE OF AHMED GLAUCOMA VALVE IN CONTROL OF PEDIATRIC GLAUCOMA

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Background: Pediatric glaucoma represents an important cause of childhood blindness. Treatment is mainly surgical. Filtering surgery has a lower success rate in children than in adults and glaucoma drainage device implantation is more frequently resorted to in eyes refractory to conventional surgical treatment.

Methods: The study included 27 eyes of 22 children with different forms of pediatric glaucoma operated upon at the

Ophthalmology department of Alexandria Main University Hospital between September 2005 and September 2010. The charts of all patients were reviewed for the age at surgery, type and details of glaucoma such as level of intraocular pressure, corneal diameter and clarity, cup/disc ratio and axial length, details of surgical and medical treatment given prior to valve surgery, as well as postoperative data of the eyes at 1,3,6,9 and 12 months as well as at the end of the follow up period. Complications were noted. All eyes were operated by a single surgeon.

Results: The mean age (\pm SD, range) of the study patients at valve surgery was 23.9 (\pm 19.6, 6-84) months and the mean (\pm SD, range) follow up period was 26.3 (\pm 17.0, 3-56) months. The most common glaucoma diagnosis was uncontrolled primary congenital glaucoma (10 eyes, 37%) and aphakic/pseudophakic glaucoma after congenital cataract surgery (10 eyes, 37%). The mean (\pm SD, range) of glaucoma surgical procedures was 1.4 (\pm 1.1, 0-4) prior to valve surgery. The mean (\pm SD, range) intraocular pressure, corneal diameter, cup/disc ratio and axial length of the study eyes before valve surgery was 24.0 (\pm 5.7, 14-36) mmHg, 12.2 (\pm 1.2, 10-15) mm, 0.7 (\pm 0.2, 0.4-1) and 24.50 (\pm 2.62, 21.64-31.66) mm respectively and postoperatively at last follow up was 18.0 (\pm 8.5, 4-40) mmHg, 12.1 (\pm 1.1, 10-14.5) mm, 0.7 (\pm 0.3, 0-1) and 25.48 (\pm 2.05, 22.79-29.93) mm respectively. Additional procedures were performed in 6 (22%) eyes. The number of glaucoma medications however increased from 0.4 preoperatively to 0.8 postoperatively. Success rates at 1, 3, 6, 9 and 12 months and at the end of the follow up period were 95.7, 80.0, 83.3, 78.6, 78.6 and 69.2 percent respectively. Complications included corneal edema, cataract, tube exposure, valve extrusion and endophthalmitis.

Conclusions: Ahmed Glaucoma Valve is an important treatment option for cases of refractory pediatric glaucoma and although associated with complications, its use has to be considered when other treatment options fail.

P585 LONG-TERM RESULTS AFTER AHMED GLAUCOMA DEVICE FOR PEDIATRIC REFRACTORY GLAUCOMA

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Purpose: To evaluate the efficacy and safety of the Ahmed glaucoma valve implant in children with refractory glaucoma in early intermediate and long term follow up period.

Patients and Methods: A retrospective study included 114 eyes (from 92 patients with refractory pediatric glaucoma, age range at surgery 2 years to 16 years, average 10 \pm 4.7 years) treated with the Ahmed glaucoma valve implant (model S3, FP8 or FP7) between January 1995 and January 2008. We reviewed the final intraocular pressure, the need for anti-glaucoma medications after surgery and the incidence of complications in all patients.

In 98 eyes, it was a secondary intention surgery after failure of one or many other kind of surgery. In 16 eyes, it was a first intention surgery. The success was defined as an average intraocular pressure less than 22 mmHg for at last 2 follow-ups in eyes with preoperative intraocular pressure greater than 22 mmHg, without additional glaucoma surgery or visually devastating complications.

Results: The most common aetiology of pediatric refractory

glaucoma was primary congenital glaucoma (68.4%) and aphakic glaucoma (17.5 %). After a mean follow-up of 72.2 months (range, 8 to 168 months), the mean intraocular pressure decreased from 35.66 \pm 6.5 mmHg before surgery to 14 \pm 5.3 mmHg at the last follow-up visit after surgery. Thus, the procedure was successful with or without medications in 92%, 82%, 73%, 47% and 37.5% of cases after 12, 24, 36, 48, 68 and 96 months. The average number of medications used decreased from 3.1 \pm 1.9 to 1.9 \pm 1.1. Complications occurred in 54 eyes (47%). Transient postoperative hypotony (less than 5 mmHg) occurred in 24 of 92 patients (27/114 eyes). This was, with transient hyphema, the most common postoperative complication. The other complications were less common: exposed tube, tenon cyst, choroidal detachment, tube corneal touch, endophthalmitis, retracted tube or tube migration. Five patients had severe visual loss and another tube obstruction.

Conclusion: Refractory pediatric glaucoma requires urgent surgery in the aim to save remaining visual function. The Ahmed glaucoma valve implant is an effective treatment for pediatric refractory glaucoma. However, the success rate decreases with the follow up. The management of complications is necessary.

P586 AHMED VALVE IMPLANT VERSUS NON-FILTERING MANAGEMENT OF NEOVASCULAR GLAUCOMA

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Background: Neovascular Glaucoma (NVG) remains a challenge to manage to the glaucoma specialists. High failure rates of trabeculectomy have lead to the endorsement of aqueous shunt devices for the treatment of NVG. However, in many areas of the world, aqueous shunt devices remain financially inaccessible. In those cases, physicians are still relying on medical management to lower intraocular pressure (IOP) and often subsequently needing cyclodestructive procedures. This study hopes to compare outcomes for management of NVG by Ahmed Valve Implant (AVI) versus medical management (non-AVI) without trabeculectomy or Ahmed Valve intervention.

Methods: 65 eyes of 63 patients with NVG were enrolled in this retrospective comparative study. Two groups of patients were evaluated: the AVI group , which consisted of patients who underwent AVI, and the non-AVI group, which consisted of patients who did not receive valve implantation, was managed medically, and whom may have needed Transscleral Cyclophotocoagulation (TSCP). Outcomes that were evaluated included visual acuity, hypotony rate, and IOP.

Results: Analysis revealed that the average follow-up was 12.1 \pm 1.1 months for the AVI group and 10.8 \pm 2.5 months for the Non-AVI group (p = 0.574). No patient in the AVI group needed TSCP, whereas 32 patients out of 35 in the medically treated group did. There was no statistically significant difference between the age, sex, IOP or visual acuity at diagnosis , baseline number of medications, or the etiology of the NVG. The final visual acuity of the AVI group 20/200 versus count fingers for the NON-AVI group. The final average IOP of the AVI group was 17.0 \pm 1 non-AVIHg, whereas the NON-AVI group was 19.0 \pm 1 non-AVIHg. The rates of hypotony were 2.0% versus 17.1% (p = 0.001), respectively for the AVI group and the NON-AVI group.

Conclusions: NVG is a secondary glaucoma that often pres-

ents with highly elevated intraocular pressures. In most instances, if it is managed medically without aqueous shunt implants or trabeculectomy, more destructive ways to reduce IOP (such as TSCP) are often ultimately needed. This study compared the use of AVI to patients to those who did not receive an aqueous shunt implant or trabeculectomy in the management of glaucoma therapy. Although no significant difference between the follow-up IOP were found amongst the two groups, the rate of hypotony was significant higher in the NON-AVI group, most likely secondary to the large eventual need to use TSCP in that group. Furthermore, the final visual acuity of the AVI group was found to be significantly higher than that of the NON-AVI group. Therefore, AVI continues to prove to be a good way to manage NVG.

P587 SHORT TERM OUTCOME OF MOLTEÑO3® IMPLANT: MALAYSIA EXPERIENCE

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Backgrounds: Glaucoma Drainage Device is mainly indicated for complicated glaucoma. Molteno3® is the latest implant designed by Prof ACB Molteno. Molteno3 has a flexible 'open sky' plate with a subsidiary ridge which later becomes a thick primary bleb. This biological valve prevents hypotony. As the IOP rises, it will lift the tissue and forms a thin permeable large bleb over the entire plate area. Here we share our experience with the first 5 patients who had Molteno3 in Malaysia. The objectives of this study were: (1) To look at the efficacy of Molteno3 in lowering IOP. (2) To look at the safety and post-operative complication associated with Molteno3. (3) To look at the post-operative IOP trends of Molteno3 tubes.

Methods: 1 year prospective observation of all Molteno3 implant done between June 2009 and June 2010.

Results: There were 5 patients (5 eyes) that had Molteno3. Two patients were female. Average age was 48.2 years old. Indications were failed trabeculectomy (1), secondary glaucoma (1), post-operative bullous keratopathy with high IOP (2) and failed glaucoma tube (1). Prior to surgery, all patients were on 4 topical anti-glaucoma and maximum dose of oral Acetazolamide. Duration of follow up was between 2 and 9 months (average 5 months). One patient with bullous keratopathy developed perforated corneal ulcer and the eye was later eviscerated. His IOP was well controlled prior to the perforation.

Conclusion: In this series, we have observed that Molteno3 is effective in lowering IOP. With additional 'vicryl tie', we didn't encounter any complication commonly associated with ocular hypotony such as choroidal effusion or flat anterior chamber. A longer study period and larger number of Molteno3 is needed to give a better picture of IOP trend, long term outcome and complication profile of Molteno3 among Malaysian population.

P588 CLINICAL STUDY OF ANTI VEGF TREATMENT COMBINED WITH GLAUCOMA MICRODRAINAGE DEVICE IN EYES WITH SECONDARY NEOVASCULAR GLAUCOMA

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Background: In managing of neovascular glaucoma it is essential to treat both the IOP elevation and underlying cause of the disease. The Anti VEGF agent bevacizumab (Avastin) is effective in inducing the regression of iris and anterior chamber angle neovascularization, but does not sufficiently lowers IOP. Intravitreal injection of Bevacizumab, can improve visual acuity, reduce IOP to safe levels and facilitate photocoagulation in eyes with neovascular glaucoma. The second step of the combined treatment – the extraocular implantation of glaucoma microdrainage device (MDD).

Methods: In study were involved 25 eyes with neovascular glaucoma. In 20 of patients neovascular glaucoma was secondary to proliferative diabetic retinopathy and in other 5 it was secondary to central retinal vein occlusion. All patients underwent intravitreal injection of 0.06 ml of bevacizumab. By 48 hours after the injection there was a partial regression of the iris and anterior chamber angle neovascularization in all patients. MDD was implanted in all eyes, four week after injection.

Results: After 3 months after operation IOP was below 20 mmHg without medication in 18 eyes and in 7 cases with use of medication, 11 eyes had substantial improvements in central vision and visual field.

Conclusion: In eyes with neovascular glaucoma intravitreal injection of the Anti VEGF agent bevacizumab (Avastin) combined with the extraocular implantation of glaucoma microdrainage device can improve visual acuity, reduce IOP to safe levels and facilitate photocoagulation.

P589 ABSTRACT WITHDRAWN

P590 AHMED GLAUCOMA VALVE IMPLANTATION WITH LONG SCLERAL TUNNEL TECHNIQUE IN REFRACTORY GLAUCOMA

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Purpose: To evaluate the efficacy and complications of Ahmed Glaucoma Valve (AGVs) implantation with long scleral tunnel technique (LSTT) on patients with glaucoma refractory to medical treatment and filtering procedures over 2 year follow-up.

Methods: Twenty-eight eyes of 27 patients with refractory glaucoma underwent AGVs implantation with LSTT. Preoperative and postoperative intraocular pressure (IOP), visual acuity (VA), number of glaucoma medications and complications were evaluated. Surgical success was defined as a final IOP of > 5 and < 22 mmHg without additional surgical treatment or serious complications. All surgeries were performed by single surgeon.

Results: The mean age of the patients was 45.03 ± 25.05 (range 5-79) years. Patients were followed for a mean period of 25.75 ± 25.75 (range 8-101) months. Significant IOP reduction occurred after AGV implantation (from 41.22 ± 10.39 mmHg to 19.18 ± 5.57 mmHg) over 2 year follow-up. Final examination the mean of number of glaucoma medications was 2.22 ± 0.44. Complications such as hypotony (%7.14), shallow anterior chamber (%10.71), choroidal effusion (%7.14), hyphema (%25), tube-cornea touch (%7.14), scleral perforation (%3.57) and tenon cyst (%64.28) were observed.

Serious complications such as phthisis bulbi, loss of light perception or endophthalmitis occurred in no patient.

Conclusions: Over 2 year follow-up, AGV implantation with long scleral tunnel technique has efficacy in terms of reduction and decrease in number of glaucoma medications with no serious complications.

P591 AHMED GLAUCOMA VALVE IN CASES OF POST-TRAUMATIC ANIRIDIA AND APHAKIA

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Background: Results of Ahmed glaucoma valve (AGV) implantation in patients with posttraumatic aniridia and aphakia have not been extensively studied.

Methods: Five patients with secondary glaucoma manifesting at various time points after artificial iris-lens diaphragm implantation for combined traumatic injury of lens and iris were operated on using the AGV. These eyes were selected for the drainage device implantation based on the consecutive failure of multiple previous glaucoma surgeries in the setting of extensive structural damage to the anterior chamber angle and trabecular zone, when traditional filtration surgery is ineffective.

Results: The duration of follow-up for this group of 5 patients was up to 12 months. Intra-operatively we did not observe any complication. In one case with severe conjunctival scarring there was a loosening of conjunctival suture on the 3rd postoperative day, requiring additional suturing. Total flat ciliochoroidal detachment with hypotony developed in 1 patient and was successfully managed medically. In all patients the intraocular pressure (IOP) control was achieved at the level of 15-17 mmHg in the early postoperative period as well as at one-year follow-up. It allowed visual function preservation in all cases. Two patients with bullous keratopathy had successful corneal transplant procedures 3 months after the AGV implantation, that resulted in visual acuity increase from 0.01 to 0.2-0.3 (decimal scale).

Conclusion: The AGV implantation for secondary glaucoma in cases of posttraumatic aniridia and aphakia conferred effective IOP control, when severe posttraumatic angle deformation precluded traditional glaucoma surgery. In addition to visual acuity stabilization, the favorable conditions were set for later reconstructive procedures.

P592 A JAPANESE CASE OF SECONDARY GLAUCOMA WITH TEN YEARS FOLLOW-UP AFTER MOLTENO IMPLANTATION

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Background: Glaucoma drainage devices are used to control intraocular pressure (IOP) in refractory glaucoma. However its use is off-label in Japan. We performed Molteno implantations in a Japanese patient over 10 years ago, and experienced some postoperative complications for the observational periods.

Case report: A 22-year-old woman was referred to us for the treatment of secondary glaucoma complicated with anterior uveitis in 1986. In the right eye, several operative interventions including 3 trabeculectomies and a cataract extraction

were performed in the right eye until 1998. In the left eye, several operative interventions including 2 trabeculectomies and a cataract extraction were performed until 1999. The IOP was not controlled in both eyes, therefore Molteno implantations were performed in the right in 1998 and in the left in 1999. Erosion of the conjunctiva over the tube of the left eye occurred in 2008. The number of the corneal endothelial cells gradually decreased in both eyes. Bullous keratopathy occurred in the left eye and penetrating keratoplasty was carried out in 2009. The corrected visual acuity was (0.1) in the right, and (0.4) in the left in 2010. The IOP was fairly controlled for 10 years after the surgery. The visual field was maintained in the left eye for these observation periods.

Conclusion: Molteno implantation was effective for refractory secondary glaucoma in a Japanese patient, however it has characteristic postoperative long term complications.

P593 SURGICAL MANAGEMENT OF REFRACTORY GLAUCOMA WITH CONSECUTIVE AHMED VALVE AND BAERVELDT TUBE SHUNT IN A TWENTY-TWO-YEAR-OLD WOMAN WITH IDIOPATHIC PANUVEITIS

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Background: Inflammatory glaucoma is a challenging issue for glaucoma specialists. A surgical approach is usually needed in order to control a high intraocular pressure (IOP) despite of maximal topic and systemic ocular hypotensive drugs. Corticoid use to control inflammation adds complexity to these cases. In addition, inflammatory glaucoma often affects young patients and causes important sequels and long-lasting effects in these patients.

Methods: We present a case of a 22-year-old woman suffering from idiopathic panuveitis since her age of 6 years old. Genetic testing for inflammatory familial diseases was reported negative on genes MEFV, TNFRSF1A and NOD2. She had pars-plana vitrectomy and lensectomy realized on both eyes, achieving good control of her panuveitis episodes with descending doses of oral corticoids. Her best-corrected visual acuity was light perception on her right eye and 20/100 on her left eye. During the last 5 years she presented several panuveitis episodes with high IOP and visual field loss.

Results: Despite of achieving control of her inflammatory state with oral corticoids, IOP progressively needed increasing topic and systemic hypotensive drugs to be controlled on her left eye. By early 2010 she was presenting a left IOP of 24 mmHg with maximal hypotensor treatment: oral Acetazolamide 250 mg t.i.d, topical Brimonidine b.i.d., topical Timolol b.i.d. and topical Brinzolamide b.i.d. She was then decided to undergo a derivative surgical procedure with implantation of an Ahmed valve. Postoperative IOP lowered to a range of 12-14mmHg during the first 45 days but increased to an IOP of 40mmHg after then. Surgical revision and cleaning of the valve was realized and showed neither obstruction nor malfunction of it. Postoperative IOP ranged between 21 and 30 mmHg during the next 5 months with maintained maximal hypotensive treatment. Filtering bleb injection of 5 FU was realized but caused no IOP reduction. Implantation of a second derivative system was then decided and Baerveldt tube shunt was elected. After 40 days of follow-up IOP is well controlled (12 mmHg) with progressively decreasing hypotensive treatment.

Conclusions: Inflammatory glaucoma is a complex one and usually needs a surgical approach consisting in derivatives procedures. Tube shunts with no valve such as the Baerveldt device are thought to achieve higher IOP reductions than the valved ones, such as the Ahmed valve. Although we prefer using the Ahmed device as first option, in this case we chose the Baerveldt one for the second implantation in this patient because of the Ahmed one not lowering the IOP as desired. Good control of the IOP has been maintained since today with this Baerveldt tube shunt implanted.

P594 SUCCESSFUL INFERONASAL AHMED GLAUCOMA VALVE IMPLANTATION IN PRESENCE OF SILICONE OIL IN THE ANTERIOR CHAMBER

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Background: To demonstrate that inferior quadrant drainage devices are a good alternative to conventional glaucoma surgery when this is not possible.

Methods: Case report: A 63-year-old myopic woman (-8 dioptres) with no history of raised intraocular pressure (IOP) had uncomplicated cataract surgery in the right eye and suffered a right retinal detachment 2 years later. This was repaired primarily with a 4 mm scleral band, later requiring 3 pars plana vitrectomies (PPV), the last of which was for removal of silicone oil. Three years after her multiple vitreo-retinal procedures, the patient was diagnosed with ocular hypertension and glaucoma, which could not be controlled despite maximal medical therapy. In view of the lack of mobility of the superior 180° of the patient's conjunctiva and the presence of emulsified oil in the superior trabecular meshwork, she was offered trans-scleral cyclodiode laser photocoagulation (TSCPC) on 2 occasions separated by 3 years.

Results: The patient presented in our glaucoma department 5 years after the last cyclodiode laser with uncontrolled IOP and clear progression of glaucomatous optic neuropathy. Because of the poor state of the superior conjunctiva and the emulsified heavy silicone oil in the superior trabecular meshwork, principally between 11 and 1 o'clock, it was proposed to place a flexible single-plate Ahmed valve in the inferonasal quadrant. Eighteen months later, the IOP is 14 mmHg with no other treatment. The valve reservoir is correctly positioned in the inferonasal quadrant, with the external tube completely covered by fascia lata and the tip inserted into the anterior chamber.

Conclusions: Ahmed valve implantation in the inferonasal quadrant, in spite of the presence of an encircling scleral band, is an effective and safe method of IOP control when other anti-glaucoma procedures are anatomically contraindicated or where other methods have failed

P595 ASOCT EVALUATION OF THE DEEP SCLERAL TRENCH TECHNIQUE OF AHMED GLAUCOMA VALVE IMPLANTATION

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Background: Based on level I evidence, aqueous shunts remain an effective option for management of glaucomas refractory to conventional therapy. The failure rate is similar

as for trabeculectomy with adjunctive antifibrotics, and in favorable cases, shunts may continue to function for more than 2 decades. However, shunts are not without problems, and tube erosion with its potential for catastrophic infections remains an important consideration. Careful suturing technique, including securing the tube to the sclera, has been reported to help minimize tube complications like tube and plate migration, retraction, and erosion. It is estimated that 2-7% of patients undergoing an aqueous shunt implantation develop melting of the overlying scleral/ pericardial patch with erosion of the tube through the conjunctiva, thus placing the eye at risk of intraocular infection. We here present a novel technique of anchoring the tube, with ASOCT based evaluation of the intrascleral position of the tube of the Ahmed Glaucoma Valve (AGV, FP 7 model), following the scleral trench technique of implantation, using anterior segment optical coherence tomography (Visante-OCT Carl Zeiss Meditec, Dublin, CA)

Methods: Eleven eyes of 11 consecutive patients who underwent AGV implantation for refractory glaucoma, not responding to maximal medical treatment, transscleral diode cyclophotocoagulation and/or previous filtering procedures were included in this prospective, interventional case series. The AGV was implanted in the superotemporal quadrant with the tube inserted through a deep 1x3 mm scleral trench, dissected carefully to a depth of 75% of the sclera thickness, underneath the partial thickness scleral flap. The intrascleral position of the tube was evaluated and the tube sclera distance (TSD) measured using anterior segment optical coherence tomography.

Results: Of the eleven patients enrolled in the study, 4 were male, and 7 female, of mixed ethnicity. The mean age of patients was 72.2 ± 9.7 years (range: 52-87 years). The mean preoperative IOP was 31 ± 5 mm of Hg (range: 25-40 mm of Hg) with an average of 3.6 ± 0.5 drugs. The mean duration between surgery and imaging was 18.6 ± 16.4 weeks (range 6-57 weeks). The postoperative IOP at the time of imaging was 13.8 ± 3.1 mm of Hg with an average of 0.3 ± 0.5 drugs. The tube was found to be well within the sclera with no changes in the sclera contour, or tenting of the overlying conjunctiva. The mean TSD was 216.4 ± 95.6 microns (range: 0-400 microns; median 220 microns), confirming that the use of a deeper intrascleral trench results in a position of the tube well within the sclera. A TSD of 0, that is, the tube level with the sclero-conjunctival interface, was seen in only one case.

Conclusions: The technique of using a deep intrascleral trench for anchoring the tube may be beneficial in ensuring that the tube remains within the sclera with no distortions of its contour. There may be a potential advantage of limiting the incidence of tube erosions, however, these require further research.

P596 RESULTS OF AHMED GLAUCOMA VALVE IMPLANTATION WITH 'HANGBACK' TECHNIQUE

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Background: Ahmed glaucoma valve is one of the commonly used glaucoma drainage device in refractory cases of glaucoma. Its insertion involves certain degree of tissue manipulation causing tissue trauma while accessing the sub-

Tenon's space and there is also risk of scleral perforation while suturing the plate to sclera. Using a new 'hangback' technique where plate is left un-sutured, there is no risk of sclera perforation and tissue handling is minimal.

Aim: To report results of Ahmed Glaucoma Valve (AGV) implantation in eyes with high risk of surgical failure, using a modified technique where plate of the AGV is not sutured to sclera (Hang Back Technique).

Materials and Methods: 88 eyes of 79 patients of refractory glaucoma in the age group of 3 to 75 years who underwent AGV implantation with or without concomitant procedures from January 2007 to December 2009 were studied. Of these, 31 eyes (39.2%) had undergone filtering surgery earlier whereas remaining eyes underwent primary AGV implantation following failure of maximal medical therapy. The minimum follow up of the patients was 6 months. All AGV implants was performed by a single surgeon.

The AGV plate was placed in the sub-Tenon's space in the supero-temporal quadrant between two adjacent recti muscles. The plate was not sutured to the sclera and was allowed to 'hang' from the tube which was anchored to the sclera 6-7mm from limbus using 6-0 vicryl suture. Anterior part of the tube was covered with a human donor sclera patch graft. The conjunctiva with Tenon's capsule was sutured to the limbus, and all eyes received subconjunctival of dexamethasone and antibiotic injection at the end of the procedure. Postoperatively, all patients received topical steroid, antibiotic and cycloplegic eye drops. Patients were followed up at day 1, day 7, 2 weeks, 4 weeks, 3 months, and 6 months thereafter.

Results: There were 23 females and 56 males in the study. The mean age was 41.56 ± 20.821 years with range: 3 years – 75 years of age. The mean (SD) IOP decreased from a preoperative value of 34.57 mmHg (10.21 mmHg) to 9.19 mmHg (6.71 mmHg) at one week, 15.90 mmHg (9.251 mmHg) at one month, 17.13 mmHg (6.42 mmHg) at three months and 15.89 mmHg (6.95 mmHg) at 6 months. Bilateral AGV implantation was done in 9 patients. The visual acuity remained stable in most of the eyes. The average number of glaucoma medications decreased from 2.92 ± 0.80 medications to 1.15 ± 0.88 . Most common complications were shallow anterior chamber in 14 eyes (17.3%), hyphema 11 eyes (11.9%), other complications include choroidal detachment and tube retraction. In 77% eyes the procedure was considered successful. Fifteen eyes underwent additional procedure such as cataract surgery or vitrectomy with AGV implantation.

Conclusion: The AGV implantation with unsutured plate is safe and effective in controlling IOP in cases of adult refractory glaucoma. This technique has the advantage of being easy, involves less dissection and eliminates the risk of sclera perforation during suturing of valve plate to sclera.

P597 PROLONGED HYPOTONY FOLLOWING GLAUCOMA DRAINAGE DEVICES IN PATIENTS UNDER SYSTEMIC IMMUNOSUPPRESSION

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Introduction: The success of a glaucoma drainage device depends on the characteristics of the fibrous capsule formed around the plate. The capsule, consisting of

collagen fibers with few cells, passes through a series of histological fibrodegenerative and fibrovascular changes which determine its final thickness and permeability. Thin capsules are associated with lower postoperative intraocular pressure; nevertheless hypotony can lead to serious complications. We present two cases of prolonged postoperative hypotony in patients with long-term immunosuppressive therapy.

Methods and Results: Case 1. A 44 years old woman with uveitic glaucoma secondary to juvenile rheumatoid arthritis, treated with methylprednisolone for 20 years and methotrexate in the last two years. Case 2. A 22 years old man with glaucoma associated with penetrating keratoplasty for ocular chemical injury, treated with cyclosporine, mycophenolate mofetil and prednisone in the last year. After implantation of Actritech and Molteno glaucoma drainage device (respectively), both patients developed long term hypotony with clinical impact. Following the revision of implants and exchanging them for valved devices, the IOP remained above 6 mmHg with recovery of preoperative visual acuity. Histopathology of the capsular tissue showed extreme thinness and characteristics of immature capsule.

Conclusion: Long-term immunosuppression can affect the thickness and permeability of fibrous capsules and produce prolonged hypotonia in patients with glaucoma drainage devices. In these cases it is advisable to use valved implants as a first choice.

Surgical Treatment: Shunts to the Supraciliary or Suprachoroidal Space (Including Cyclodialysis)

P598 RESULTS OF AQUEOUS DRAINAGE FROM ANTERIOR CHAMBER INTO SUPRACHOROIDAL SPACE BY USING CORNEAL ALLOTRANSPLANT AS A DRAINAGE DEVICE IN MANAGEMENT OF REFRACTORY GLAUCOMA

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Background: Refractive glaucoma is difficult to treat. In most of the cases painful eyeballs are subjected to either enucleation or enucleation. Failure rate of traditional filtering procedures in such cases is high – up to 50%, the reason being severe fibrosis of filtering zone. Different implants and drainage devices have been proposed to enhance fluid drainage with limited successes. We propose to use corneal allotransplant prepared from donor corneal tissue as a drainage device. Various histological studies have proved low cellular reaction from surrounding eye tissues in case of its implantation.

Aim: To evaluate early and long term results of corneal allotransplant as a drainage device in management of refractory glaucoma.

Methods: Under the innovative educational program of the Russian people's friendship university, a total of 13 patients

(13 eyes) suffering from refractory glaucoma were operated upon. Out of these there were 2 cases with end stage glaucoma, 3 cases with failed glaucoma surgery and 4 cases each with neovascular and thrombotic glaucoma. Visual acuity varied from 0.01 to complete loss of vision. Patients were subjected to complete ophthalmic check up. Allotransplant prepared from donor cornea in the form of a strip (length-5mm, height and width 0.35-0.4 mm) was dried on silica gel under protection of antioxidants. Follow up period up to 3.5 years.

Steps of Operation: 1. Prophylactic scleral trephination is made in temporal-inferior quadrant. 2. A 8 to 10 mm limbus based conjunctival flap is fashioned superiorly. 3. With the help of a razor blade, a half thickness scleral flap, each side about 4-5 mm long, with the base towards the limbus is fashioned. 4. At the apex of the scleral bed, choroidal tissue is exposed by removing a strip of deep scleral tissue, followed by cyclodialysis towards equator of eye ball. 5. Trabeculectomy is performed. 6. Peripheral iridectomy is performed. 7. One end of the allotransplant is inserted into anterior chamber and other end under sclera into suprachoroidal space. 8. Allotransplant is stitched to the scleral tissue. 9. The scleral flap is stitched back to its original place. 10. The conjunctival flap is stitched.

Results: All patients got relief from pain. IOP normalized in all cases. In 3 cases (23%) visual acuity improved. On next day after operation hyphema was observed in 5 cases (38.5%), which dissolved spontaneously. In one case allotransplant was exchanged for another bigger one to facilitate adequate aqueous drainage. Following IOP changes were noticed: up to 2 months after operation IOP remained under control in all cases; after 4 months high IOP was noticed in 5 cases, which was controlled with additional glaucoma medication; after 1 year another patient had high IOP, which was also controlled with glaucoma medication.

Conclusions: Use of corneal allotransplant as drainage device in modified trabeculectomy procedure keeps the intrascleral space open and facilitates aqueous drainage from anterior chamber into suprachoroidal space and under conjunctiva. Long term results show effectiveness of the proposed method in treating patients suffering from refractory glaucoma.

P599 EXPERIMENTAL AND CLINICAL STUDY OF THE HYPOTENSIVE ACTION OF AUTOSCLERAL CYCLOGONIODRAINAGE WITH SECONDARY POST-BURN REFRACTORY GLAUCOMA

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Background: The burns of eyes are the heaviest form of the damage of the eye. The frequency of the eye burns according to the data of the different authors is from 6,1 to 38,4% among all forms of the injuries of the eye. In patients with the severe consequences of eyeburns secondary glaucoma according to literature data is developed in 15-46.1% of cases, in 8-57.4% it became the reason for the functional loss of eye. Experimental and clinical experiments showed that secondary post burn glaucoma, as the majority of the forms of secondary glaucoma, has the retention nature. The most severe burns are accompanied by the necrosis

of the outflow ways of aqueous humor, which concludes with their cicatrisation. The traditional anti-glaucoma fistulizing operations in patients with post-burn glaucoma, are as a rule impossible or ineffective.

Methods: We analysed the results of our anti-glaucoma operations – autoscleral cyclogoniodrainage with the strip of autosclera (ACGD(S)) and its modifications – autoscleral cyclogoniodrainage with the fold of autosclera (ACGD(F)) in an experiment and clinic. Eight rabbits (8 eyes) were used in this study. Animal usage conformed to the ARVO Resolution on the Use of Animals in Research. In experiment the level of IOP, the hydrodynamics of aqueous humor outflow were studied before and after ACGD(F), histomorphological analysis was conducted. In clinic ACGD(S) was performed in 30 eyes (32 operations) and ACGD(F) was performed in 67 eyes (74 operations) with scarry changes in the front division of eye and diagnosed secondary glaucoma. Before the operation the ophthalmotonus was increased in all patients – range 31.0-54.0 mmHg.. Visual acuity in all patients was equal to light-perception. Different anti-glaucoma operations previously were conducted in majority of patients. Criterion of effectiveness of the anti-glaucoma operation was the compensation of intraocular pressure (IOP) in the early and distant postoperative period.

Results: Following ACGD(F) (in experiment) mean IOP was reduced from 20.75 ± 3.3 mmHg preoperatively to 11.6 ± 4.35 mmHg sixth months postoperatively. This reduction was statistically significant ($p < 0.05$). The IOP was reduced because of oppressing of the aqueous humor production and creation of new ways of outflow of aqueous from the anterior chamber to the suprachoroidal space. In early postoperative period (in clinic) compensation of IOP occurred in all patients. The decompensation of IOP in the distant postoperative period (up to 2 years) occurred in 40.63% of cases after ACGD(S) and in 21.62% of cases after ACGD(F).

Conclusion: Usage of ACGD(S) and ACGD(F) allowed normalizing intraocular pressure and preserving visual functions in the majority of patients with the refractory postburn glaucoma. However, use ACGD (F) made it possible to reach normalization of IOP in the larger number of cases in two year follow-up period.

P600 SUPRACILIARY SHUNT IN REFRACTORY GLAUCOMA

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Backgrounds: To evaluate the efficacy of Gold Micro Shunt for suprachoroidal drainage in refractory glaucoma patients.

Methods: Prospective uncontrolled case series. Fifty-five eyes of fifty-five patients with uncontrolled refractory glaucoma were included. Before inclusion, the eyes averaged 1.9 (range from 1 to 5) previous glaucoma surgery procedures. Forty eyes were pseudophakic, 12 phakic and 3 aphakic. The mean baseline IOP was 30.8 mmHg (range: 22 to 58) despite maximal medical therapy. Study eyes underwent Gold Micro Shunt implantation in the supraciliary space. Follow-up visits were performed on day 1, week 1, month 1, 3, 6, 12 and 24; patients underwent slit-lamp examination, ultrasound biomicroscopy and gonioscopy.

Results: After two years follow-up, a qualified success was achieved in 37 eyes (67.3%), and a complete success in 3 eyes (5.5%). In success group patients, mean IOP decreased

from 27.6 at baseline to 13.7 mmHg after two years of follow-up; the mean number of post-operative medications was 1.4, compared with a preoperative value of 2.5. Mild side-effects occurred in 21 patients, with mild or moderate post-operative hyphema being the most frequent one. Development of a thin membrane, obstructing the anterior holes, was the most important factor affecting the efficacy of this device; it was found to be present in 12 patients of failure group (66.7% of failures). **Conclusion:** Gold Micro Shunt for refractory glaucoma showed a two-year success rate lower than tube implants devices.

P601 UBM IMAGING OF CYPASS SUPRACHOROIDAL DEVICE: EARLY AND TWO MONTHS FEATURES OF THREE CASES

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Purpose: To analyze ultrabiomicroscopy (UBM) of anterior segment after CyPass suprachoroidal device surgery.

Methods: CyPass is a shunt designed to be implanted into the anterior chamber angle through a corneal incision, bringing the aqueous fluid into the suprachoroidal space. Four patients underwent CyPass implantation in one eye. All patients had open angle on gonioscopy prior to surgery. All patients were pseudophakic, two had mild glaucoma, two had moderate glaucoma and a prior filtering surgery. One patient was excluded from analysis due to shunt misplacement one month after the implant. Mean pre-op IOP was 22.3 mmHg and mean pre-op number of meds was 3.3.

Results: Two months after surgery mean IOP was 21.6 mmHg and mean number of meds was 1.3. No significant complications were noted immediately or later in the follow-up. UBM was carried out one week and two months after surgery. In all the 3 cases first UBM showed a cyclodialysis corresponding to the shunt position, with an hyporeflective area in the suprachoroidal space, likely corresponding to aqueous fluid accumulation (Fig. 1 and 2). After 2 months, UBM showed that the device was in the same position in all cases, surrounded by hyperreflective tissue; cyclodialysis disappeared in all cases (Fig. 3), while hyporeflective area was no more visible in two cases (Fig. 4), and limited to a narrow band in the third case (Fig. 5). The last case was the only patients med-free at the end of the follow-up. UBM imaging of CyPass shunts showed cyclodialysis and fluid accumulation early after the surgery. After two months this features are no longer evident in almost all cases. The presence of a narrow band of fluid in the only patient with good IOP control without meds is consistent with the supposed mechanism of action of the shunt, and obviously deserves further studies, due to the small number of cases in this series.

Conclusion: UBM seems to be an useful tool to assess the modifications occurring after this kind of surgery.

P602 SUPRACHOROIDAL SILICON TUBE IMPLANTATION AFTER ANTERIOR CHAMBER INJECTION OF BEVACIZUMAB IN PATIENTS WITH NEOVASCULAR GLAUCOMA

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Purpose: To evaluate the effectiveness of suprachoroidal silicon tube implantation after anterior chamber injection of bevacizumab in patients with neovascular glaucoma (NVG).

Material and Method: This study included in 6 eyes of 6 patients with refractory NVG. Suprachoroidal silicon tube implantation was performed in 6 eyes after anterior chamber bevacizumab (1.25mg/0.1ml) injection. Neovascularization of the iris and anterior chamber angle, intraocular pressure, and the clinical outcomes were evaluated.

Results: There were 4 men and 2 women with an average age of 55.3 ± 5.6 years. All eyes had rubeosis iridis and uncontrolled refractory NVG. The baseline intraocular pressure (IOP) was 38.8 ± 11.1 mmHg. One week after one dose of 1.25mg bevacizumab injection into the anterior chamber, suprachoroidal silicon tube implantation was performed. The mean IOP was 12.4 ± 6.5 mmHg after the procedure. IOP was increased after 2 months of the treatment except in one patient. After the mean follow-up period of 13 months, IOP was controlled without any medical treatment only in one patient. IOP was controlled with maximum medical treatment in one patient and in the other 4 patients IOP was not controlled. Any intraoperative and postoperative complications were not observed during the follow-up period.

Conclusion: Suprachoroidal silicon tube implantation after the injection of bevacizumab into the anterior chamber was not an effective treatment method in patients with refractory neovascular glaucoma. It provides a transient reduction of IOP. Bevacizumab injection into the anterior chamber before the procedure prevents development of complications.

Surgical Treatment: Combined Cataract And Glaucoma Surgery

P603 COMPARATIVE STUDY OF ONE SITE VERSUS TWO-SITE PHACOTRABECULECTOMY

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Background: Combined cataract extraction, intraocular lens implantation and trabeculectomy is now widely accepted for managing patients with visually significant cataract and poorly controlled glaucoma. Combined procedure may be done either through the same (cataract) incision or through incisions at two different sites for phacoemulsification and trabeculectomy but the choice remains controversial. The purpose of the study was to compare the visual outcome, surgically induce astigmatism, control of intraocular pressure and requirement of anti-glaucoma medications after one site and two site phacoemulsification and trabeculectomy.

Methods: This was a prospective study involving two groups of cataract glaucoma patients. 40 eyes of 40 patients were included in the study. One site group underwent superior phacoemulsification and trabeculectomy and two site group underwent superior phacoemulsification and superotemporal trabeculectomy through two separate incisions. The scleral flap was closed three 10-0 sutures in both groups

Results: Preoperative intraocular pressure in the one site and two site groups were 20.05 ± 3.17 and 21.55 ± 6.9 mmHg respectively. Postoperatively, by 6 months, the mean intraocular pressure of the two groups had become 14.5 ± 4.27 and 14.15 ± 3.21 mmHg respectively in the one site and the

two site group ($p = 0.38$). Postoperative day 1 IOP was higher in the two site group. Both surgical strategies were able to eliminate the need for anti-glaucoma medications in most eyes for the entire study period. Progression of the cup to disc ratio was noted in both the groups in the postoperative period at 6 months but there was no difference between the two groups. Mean preoperative visual acuity of patients improved significantly in both the groups by the end of the study period. The difference in the mean surgically induced astigmatism was not found to be statistically significant.

Conclusions: Both surgical strategies (one site and two site phacotrab surgery) resulted in statistically significant reduction in intraocular pressure. There is no statistically significant difference in the degree of reduction of intraocular pressure between one site and two site phacoemulsification and trabeculectomy and the requirement of glaucoma medications also did not differ significantly between the two groups. Surgically induced astigmatism was comparable after one site and two site surgery.

P604 THE GRADUATED IRIDODIALYSIS WITH THE PLASTY OF IRIS AT THE SURGERY OF SECONDARY PHACOMORPHIC GLAUCOMA WITH ORGANIC BLOCK OF ANTERIOR CHAMBER ANGLE

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Backgrounds: Secondary phacomorphic glaucoma with organic block of anterior chamber angle is serious problem which leads to irreversible vision lost. The purpose of our work is to evaluate the effectiveness of our own method of surgical treatment of secondary phacomorphic glaucoma with organic block of anterior chamber angle.

Methods: We have observed 18 patients ill with the secondary phacomorphic glaucoma aged from 50 to 64 years. The preoperative IOP varied from 34 to 48 mmHg on the hypotensive regimen. The depth of anterior chamber varied from 1.2 to 2.5 mm, lens thickness made 4.6-6.1 mm. All patients underwent surgical treatment which consisted of 3 components: 1. phacoemulsification with IOL implantation; 2. the graduated iridodialysis in the places of the maximum closure of anterior chamber angle; 3. the plasty of the iris using trapeziform suture.

Results: Operations and postoperative periods were uneventful in all cases. IOP decreased down to 22 mmHg in early postoperative period in all patients. 10 patients had no hypotensive regimen, 8 patients instilled 0.5% timolol drops twice a day. Vision acuity increased up to 0.6-1.0 with correction in all patients.

Conclusion: Suggested method of surgical treatment of patients ill with secondary phacomorphic glaucoma with organic block of anterior chamber angle allowed to normalize IOP and increase the vision acuity in all cases.

P605 CHANGES IN PACHYMETRY AND KERATOMETRY AFTER PHACOTRABECULECTOMY

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Background: Combined cataract extraction, intraocular lens implantation and trabeculectomy is now widely accepted for managing patients with visually significant cataract and poorly controlled glaucoma. Increasing evidence suggests that Central Corneal Thickness (CCT) not only influences

intraocular pressure (IOP) levels, but also predicts the risk of glaucomatous optic neuropathy. CCT has been assumed to be a major factor for corneal rigidity, and it is the only parameter that can be measured easily and in vivo up to now. Alterations affecting corneal biomechanical properties appear to occur during glaucoma development and may alter with treatment.

Methods: We conducted a prospective study involving 40 eyes of 28 consecutive patients undergoing phacotrabeculectomy. A complete glaucoma work up was done in all patients. Applanation intraocular pressure (IOP) recorded, CCT was measured using ultrasonic pachymeter and keratometry done using autorefractometer-keratometer (Potec Co.Ltd PRK -5000 Autorefr-Keratometer). Phacoemulsification and trabeculectomy was performed under peribulbar anesthesia using one site or two site approach. Phacoemulsification was done using OPTIKON 2000 Pulsar Minimal Stress Phacoemulsification System. Patients were followed up postoperatively on 1st day, 1st week, 4th week, 3rd month and 6th month. Goldmann's applanation tonometry, keratometry and pachymetry was repeated at 6 months after the surgery. The surgically induced astigmatism was calculated using the SIAC (Surgically induced astigmatism calculator) using vector analysis. Statistical analysis was done using paired t-test.

Results: The mean IOP was 24 mmHg and 17.5 mmHg, mean CCT was 504.8 (SD = 43.6) and 516.8 (SD = 49.1) respectively before and six months after combined procedure. There was a statistically significant increase in CCT after the combined procedure. 50% of the patients had against the rule astigmatism preoperatively, while 55% of the patients had with the rule astigmatism postoperatively. There was no statistically significant difference between one site and two site phacotrabeculectomy, with reference to surgically induced astigmatism and CCT.

Conclusion: CCT may increase after combined procedure. This may have a cause and effect relationship with applanation IOP and its effects on the glaucoma. The change in corneal biomechanical property after phacotrabeculectomy may influence in the follow up and further management of glaucoma patients.

P606 UVEITIC GLAUCOMA NEEDS LESS TRAUMA, OUT-COME OF NON-PENETRATING GLAUCOMA SURGERY: LONG-TERM RESULT

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Purpose: To investigate the efficacy of non penetrating glaucoma surgery in controls the intraocular pressure (IOP) in uveitic glaucoma.

Design: Prospective, non-comparative case study.

Patients and Methods: This study based on 29 consecutive eyes of 18 patients with uveitic glaucoma underwent non penetrating deep sclerectomy with implant. All patients received anti-inflammatory medications before and after surgery. Goniopuncture done for cases developed high IOP after surgery.

Main Outcome Measures: Control of intraocular pressure. The number of anti-glaucoma medications required to control the intraocular pressure. Visual acuity and complications associated with the surgery were monitored. Number of cases underwent goniopuncture and time of interference.

Results: The mean follow-up was 33.21 ± 19.93 (range 12-89). Intraocular pressure was reduced from a mean preoperative value of 37.66 to a mean postoperative value of 15.07 mmHg (Wilcoxon signed rank test $p = 0.005$). Complete success was obtained in 20 eyes 69%, qualified success was obtained in 27 eyes 93.1%, and complete failure in two eyes 6.9%. Mean number of anti-glaucoma medications was reduced from 3.24 to 0.41 (Wilcoxon signed rank test $p = 0.001$). Neodymium: YAG goniopuncture was performed in 12 eyes (41.4%). Postoperative complications included transient hypotony in 6 eyes, hypotony with persistent maculopathy in one eye, shallow choroidal effusions in four eyes, hyphema in one eye, decompression retinopathy in one eye and progression of cataract in nine eyes. Goniopuncture was done in 12 eyes (41.4%).

Conclusion: Glaucoma is a common and serious complication of uveitis. Glaucoma should not be an obstacle for aggressive treatment of intraocular inflammation. Deep sclerectomy is an effective and safe procedure in open angle uveitic glaucoma.

P607 PHACOEMULSIFICATION AND ENDOSCOPIC CYCLOPHOTOCOAGULATION AS PRIMARY SURGICAL PROCEDURE IN COEXISTING CATARACT AND GLAUCOMA

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Purpose: To evaluate the safety and efficacy of phacoemulsification and endoscopic cyclophotocoagulation (ECP) as a primary surgical treatment for glaucoma and cataract.

Methods: Three hundred sixty-eight eyes from 243 patients with primary open-angle glaucoma and cataract from the Centro Brasileiro de Cirurgia de Olhos that underwent an uncomplicated surgery from October 1998 to December 2006 with at least 2 years of follow-up were retrospectively enrolled. The patients were excluded if presented with a previous ocular history of any intraocular surgery or glaucoma laser treatment. Qualified success was defined as 5 mmHg < intraocular pressure (IOP) < 21 mmHg with or without topical anti-glaucomatous drugs, and complete success as the same IOP levels without therapy at all timepoints. Additionally, the need of any further glaucoma surgery was defined as failure.

Results: The mean follow-up was 35.15 ± 8.14 months. The IOP pre-operatively (23.07 ± 5.52 mmHg) was significantly greater than in the first day post-operatively (13.14 ± 6.09 mmHg), and months 1 (11.03 ± 2.59 mmHg), 6 (12.33 ± 3.01 mmHg), 12 (12.19 ± 2.19 mmHg), 24 (12.14 ± 2.89 mmHg) and in the last appointment (12.29 ± 2.44 mmHg) ($p < 0.001$ in all timepoints). The number of medications pre-operatively (1.44 ± 0.97) decreased (0.37 ± 0.74) ($p < 0.001$). Furthermore, there was significantly improvement in the LogMar visual acuity ($p = 0.01$). 334 (90.76%) eyes achieved qualified success, and 205 (55.7%), complete success. Complications included immediate post-operative IOP spike 14.4% (53/368), post-operative fibrin exudates in anterior chamber 7.06% (26/368), cystoid macular edema 4.34% (16/368), transitory hypotony 2.17% (8/368), iris bombé 1.08% (4/368).

Conclusions: Phacoemulsification associated with endoscopic cyclophotocoagulation is safe and effective as a primary procedure for combined glaucoma and cataract.

P608 AB INTERNO TRABECULOTOMY AS A HYPOTENSIVE COMPONENT IN COMBINED SURGERY OF CATARACT AND GLAUCOMA

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Background: We should like to introduce the technology of ab interno trabeculotomy in combined surgery of cataract and glaucoma and its results.

Methods: In this retrospective study 102 eyes of 80 patients with primary open-angle glaucoma and cataract were enrolled. Mean preoperative IOP was 29.0 ± 4.8 mmHg (range, 24 to 56 mmHg), mean visual acuity was 0.25 ± 0.12 (range, light perception to 0.7). All the patients underwent combined operation including phacoemulsification, IOL implantation, ab interno trabeculotomy with a special trabeculotome spatula (60 – 120°) in the nasal segment of the eyeball.

Results: Mean follow-up period made 18 months. At the end of follow-up mean IOP was 18.0 ± 2.7 mmHg, mean visual acuity was 0.64 ± 0.15 . Complications: hypertension at the first day post-op – 16 cases (16%), hyphema – 14 (14%), exudate – 6 (6%). Hypotensive medications were used after surgery in 13 eyes (13%), 5 (5%) of them later underwent glaucoma surgery of other types.

Conclusion: Combined phacoemulsification and ab interno trabeculotomy is effective and has low complications rate in patients with coexisting cataract and glaucoma.

P609 RESULTS OF COMBINED TRABECULECTOMY WITH MANUAL SMALL-INCISION CATARACT SURGERY USING A MODIFIED TECHNIQUE

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Objective: To analyze results of combined trabeculectomy and manual small incision cataract surgery using a modified technique.

Materials and Methods: The charts of 59 eyes that underwent combined trabeculectomy and small incision cataract surgery, using a modified technique without use of mitomycin-C, between February 2007 and November 2008 were reviewed. Outcome measures were intraocular pressure (IOP) reduction and reduction of number of medications. Minimum follow-up period was restricted to 3 months or more.

Results: Mean follow-up was 54.1 ± 31.5 weeks (Range 13.1 – 116.9 weeks) with 50.8% having a follow up of 1 year or more. Mean preoperative IOP was 22.10 ± 7.35 mmHg and the mean postoperative IOP at last mean follow-up was 13.71 ± 3.12 mmHg. Mean IOP Reduction was 8.39 ± 7.81 mmHg ($p < 0.000$). All patients had postoperative IOP level of < 21 mmHg and 81.4% had IOP level of ≤ 16 mmHg. The mean reduction of number of medications was 2.017 ± 0.956 ($p < 0.000$). 98.3% of patients did not require medications to maintain IOP levels. There were minimal operative complications and good bleb morphology at last follow-up review.

Conclusions: Combined trabeculectomy and manual small incision cataract surgery is a promising practical alternative compared to the costly phacotrabeculectomy procedure for developing countries.

P610 COMBINED CATARACT AND GLAUCOMA SURGERY – RECENT SYDNEY EXPERIENCE

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Background: To report the outcomes of patients who underwent phacoemulsification combined with trabeculectomy for management of glaucoma.

Methods: Retrospective case review of the past 21 consecutive patients (23 eyes) who had combined phacoemulsification and trabeculectomy procedures. Intraocular pressure and visual acuity pre and post operatively were recorded as was the need for subconjunctival injection of 5-fluorouracil or a needling procedure. Use of topical glaucoma medication at follow up was also assessed.

Results: Patients were followed for a minimum of 6 months. Pre operative visual acuity improved or remained stable in 21 eyes. Mean preoperative visual acuity was 6/12 improving to 6/9 postoperatively. Average intraocular pressure reduction was 47%, with one patient having higher intraocular pressures post procedure. Mean preoperative intraocular pressure was 25, falling to 12 postoperatively. 87% of patients did not require glaucoma medications postoperatively. Needling was performed on 6 eyes, with a maximum of only one needling per eye. 18 eyes needed injections of 5-fluorouracil.

Conclusion: Combined phacoemulsification trabeculectomy surgery is an effective procedure and may be considered in glaucoma patients on maximal medical therapy with visually significant cataract. In our experience trabeculectomy alone has a slightly greater intraocular pressure reduction and the requirement for fewer glaucoma medications postoperatively. However, given the improvement in visual acuity and definite pressure improvement following the combined phacoemulsification and trabeculectomy procedure, it is a valuable option in patients with both pathologies.

P611 ONE-YEAR SUCCESSFUL OUTCOME OF COMBINED PHACOEMULSIFICATION AND DEEP SCLERECTOMY WITHOUT COLLAGEN IMPLANT OR MITOMYCIN C IN JAPANESE EYES WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Background: Several studies have reported favorable outcomes after deep sclerectomy with collagen implant and/or mitomycin C (MMC) in eyes with primary open-angle glaucoma (POAG). The purpose of this study was to determine the one year outcome of combined phacoemulsification with intraocular lens implantation (PEA-IOL) and deep sclerectomy without collagen implant or MMC in Japanese eyes with POAG.

Methods: This was a prospective, non-comparative case series. Thirty-four of 34 patients with POAG and surgical indications for cataract surgery underwent combined PEA-IOL and deep sclerectomy without collagen implant or MMC between November 2008 and November 2009. The intraocular pressure (IOP), surgical complications, number of glaucoma drugs, and best-corrected visual acuity (BCVA)

were investigated. In addition, the relationship between the IOP and the lake area of the deep sclerectomy, determined by ultrasound biomicroscopy (UBM) was assessed. A single UBM radial scan perpendicular to the limbus was done to evaluate the maximum anteroposterior lake length and maximum lake height.

Results: The mean age of the patients was 76.5 ± 6.9 years. The mean preoperative IOP was 16.3 ± 3.6 mmHg, and the mean preoperative number of glaucoma drugs was 1.1 ± 0.92. During the postoperative period, 3 eyes dropped out of the study. At one year postoperatively, the mean IOP was significantly decreased to 12.8 ± 3.1 mmHg ($p < 0.01$), and no glaucoma drugs were needed in any cases. One eye required glaucoma drugs just after surgery but this patient dropped out of the study at 3 months postoperatively. There were no cases in which the BCVA decreased postoperatively. In one eye, a posterior capsular rupture during the surgery and postoperative transient IOP elevation occurred. There were no other serious surgical complications. Fifteen eyes were examined by UBM at 12 months postoperatively. In all eyes of these eyes, a lake was observed, but the correlation between the cross sectional area of the lake and the IOP was not significant ($p = 0.23$).

Conclusion: Combined PEA-IOL and deep sclerectomy without collagen implant or MMC showed excellent IOP reduction without serious complications during the one-year period postoperatively.

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P612 SURGICAL OUTCOME OF TRABECULOTOMY COMBINED WITH CATARACT SURGERY FOR EXFOLIATION GLAUCOMA

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Background: Exfoliation glaucoma (XFG) is often seen in the older people. XFG is treated in accordance with the treatment for primary open-angle glaucoma. However when diagnosed, most patients already have ocular hypertension and progressed visual impairment. In addition, XFG is resistant to medication and often requires surgical intervention but the prognosis is poor. It has been reported that trabeculotomy is effective, and when coexisting with cataract, combined procedure with cataract surgery (phacoemulsification & aspiration with intraocular lens implantation; PEA+IOL) has good results with indicating 1st surgical intervention. We evaluated the surgical outcome of trabeculotomy combined with PEA + IOL for XFG.

Methods: The total of 143 eyes of 121 patients (77 eyes of

69 men, 66 eyes of 52 women) with medically uncontrolled XFG and cataract underwent trabeculectomy combined with PEA + IOL. The mean age was 73.9 ± 6.8 years (range, 52 to 88 years). The mean follow-up period was 30.7 ± 26.2 months (range, 3 to 115 months). Intraocular pressure (IOP), the number of anti-glaucoma medications, success rate by Kaplan-Meier survival analysis ($\text{IOP} \leq 20$ mmHg), intraoperative and postoperative complications, the number of patients who underwent additional glaucoma surgery, and visual prognosis were retrospectively reviewed.

Results: Mean preoperative IOP was 23.8 ± 6.0 mmHg. Mean postoperative IOP was 14.6 ± 3.7 mmHg at 12 months, 15.3 ± 3.9 mmHg at 24 months, 15.5 ± 8.0 mmHg at 36 months. Postoperative IOP at all time points was significantly lower than preoperative IOP. The success rate was 95.9% at 1 year after surgery, 73.4% at 3 years, and 58.3% at 5 years. The complications included transient elevation in IOP of more than 30 mmHg in 32 eyes (22.4%), Descemet's membrane detachment in 9 eyes (6.3%), and prolonged hyphema in 3 eyes (2.1%). Additional glaucoma surgery was performed in 22 eyes (trabeculectomy: 11 eyes, trabeculectomy: 11 eyes). Postoperative visual acuity decreased by more than two lines in 14 eyes (9.8%). Finally, progressive visual field loss occurred in 36 eyes (25.2%) and central visual field loss in 5 eyes (3.7%).

Conclusion: Trabeculectomy combined with PEA + IOL for XFG with cataract is effective for the 1st surgical intervention with less complications, but has some limitations. The effect diminishes over time, and some patients require additional surgical intervention. Careful observation for a long time is needed.

P613 PHACOTRABECULECTOMY AS TREATMENT OF IOP ELEVATION AFTER ACUTE ANGLE CLOSURE

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Purpose: The aim of this case report is to refer about case of acute angle closure that was not resolved by multiple laser surgeries. Acute angle closure was diagnosed in 59-year old woman. Intraocular pressure (IOP) in her left eye was 46 torr and visual acuity (VA) was hand movement. VA of fellow eye was 0.5 with +5.5 Dsf and the IOP was normal. The initial therapeutic intervention included 250 mg of acetazolamide per os, topical beta-blocker and pilocarpine. The IOP remained high, so we decided to terminate the attack by YAG laser peripheral iridotomy (PLI). Topical hyperosmotic glucose solution was used to reduce the corneal edema. Due to very shallow anterior chamber and remaining corneal edema the PLI could not be successfully completed. The IOP decreased to 28 torr. Patient used topical miotics 5 times a day. The IOP on the next day was 16 torr and VA 0.05 with +5.0 Dsf. It was not possible to create a patent iridotomy due to striate keratopathy. The enlargement of PLI was planned for the next visit in few days. The patient missed this visit and came after 3 weeks with blurred vision and painful left eye. The IOP was 50 torr. Gonioscopy revealed closed angle with formation of anterior synechiae in the upper part. A new patent sequence argon / YAG laser PLI was done immediately. An argon laser iridoplasty was performed on the next day.

The IOP was controlled after laser surgeries only temporarily – for about 3 weeks only. Then the IOP remained more than 40 torr despite using maximal anti-glaucoma therapy. The visual acuity was 0.1 with +5.0 Dsf. The IOP elevation at this time could be resolved only by surgical approach. We decided between trabeculectomy using mitomycin C, phacoemulsification alone and combined phacotrabeculectomy. Trabeculectomy performed in short time after acute angle closure can have higher rate of possible surgical complications such as malignant glaucoma development or cataract formation. Cataract surgery alone would not lead to significant IOP decrease. We decided to perform combined two side phacotrabeculectomy. Before the surgery 20% Mannitol infusion was used to lower the IOP. Conjunctival and scleral flap was prepared. A temporal clear corneal cataract surgery was performed. Healon GV was used to protect the corneal endothelium. A single piece Acrysof +33.0 diopter lens was implanted in the capsular bag. The corneal incision was sutured with 10/0 Nylon. Trabeculectomy was completed and the scleral flap sutured with 3 10/0 Nylon sutures, with a possibility of future laser suturolysis in case of high IOP postoperatively. The IOP is now controlled using monotherapy of prostaglandin analogue. Visual acuity improved in few days to 0.5. Phacotrabeculectomy can be used as treatment of choice in angle-closure glaucoma patients with coexisting cataract and uncontrolled IOP.

P614 COMBINED PHACOEMULSIFICATION AND ENDOSCOPIC CYCLODIODE PHOTOCOAGULATION FOR THE MANAGEMENT OF CATARACT AND GLAUCOMA

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Purpose: To determine the efficacy and safety of performing combined phacoemulsification and endoscopic cyclo diode photocoagulation (ECP) in patients with glaucoma requiring cataract surgery.

Methods: The medical records of patients that had undergone combined phacoemulsification and ECP between 2001 and 2009 at the Western Eye Hospital, London were retrospectively reviewed. In all cases, treatment involved phacoemulsification with intraocular lens inserted 'in the bag' via a temporal clear corneal incision followed by 270 – 360 degree ECP (E2 Endo Optiks, NJ, USA). Patients were excluded from the study if they were lost to follow-up within 12 months of surgery. Visual acuity, IOP and number of medications were recorded before surgery and at 3-months, 6-months, 9-months and 12-months following surgery. Early and late post-operative complications were also recorded.

Results: Forty-two eyes of 38 patients met the inclusion criteria. Mean age at the time of surgery was 72.62 ± 10.14 years. Fifty-seven percent were male. Types of glaucoma included: primary open angle (73.8%), chronic angle closure (11.9%), uveitic (4.8%), angle recession (2.4%), iridocorneal endothelial syndrome (2.4%), exfoliative (2.4%) and normal tension (2.4%). Pre-operatively, LogMAR visual acuity was 0.84 ± 0.69 with mean IOP 22.36 ± 6.52 mmHg on 2.83 ± 0.98 IOP lowering medications. At 3-months following surgery, IOP had reduced to 15.60 ± 2.30 mmHg and was maintained by 12-months (15.90 ± 2.28 mmHg). By the end of the study period, visual acuity had improved to LogMAR 0.37 ± 0.27 and the number of IOP lowering medications had

reduced to 1.60 ± 0.89 . Complications included fibrinous uveitis (7.2%), corneal decompensation (4.8%), posterior vitreous detachment (4.8%) and surgically induced astigmatism (2.4%). There were no cases of hypotony. Two patients (4.8%) required repeat ECP to control IOP.

Conclusions: This study suggests combined phacoemulsification and ECP is both safe and effective in patients with glaucoma and cataract. It provides IOP lowering and reduced dependence on IOP lowering medications whilst addressing the visual disability caused by cataract in a single surgical treatment. Prospective and longer-term studies are needed to help better understand the benefits and complications of this treatment.

P615 INTRAOCULAR PRESSURE CONTROL AFTER CATARACT SURGERY IN EYES WITH PREVIOUS AUGMENTED TRABECULECTOMY

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Background: Trabeculectomy and in particular, augmented trabeculectomy is the current gold standard as a primary surgical intervention for medically uncontrolled glaucoma. The Collaborative Initial Glaucoma Treatment Study has demonstrated that trabeculectomy increases the risk of cataract formation eightfold in the first year postoperatively year and fourfold over 5 years. It is widely accepted that cataract surgery can lead to loss of IOP control due to filtration failure. However, it has been suggested that the use of the anti-metabolite 5-fluorouracil at the time of cataract surgery may prolong functioning bleb survival. This study aims to further investigate the role of 5-FU in bleb survival after cataract surgery.

Methods: Data for 122 patients was collected prospectively. All patients had previously had a MMC augmented trabeculectomy. Cataract surgery was performed using a standard phaco-emulsification technique. A 0.5 mg/0.2 ml sub-conjunctival 5-FU injection was administered immediately after completion of the cataract surgery posterior to the bleb site. Topical steroids and non-steroidal anti-inflammatory drops were prescribed for approximately three months after surgery. Demographic data, IOP, additional interventions and medications were recorded.

Results: At 12 months, adequate IOP control was retained without drops or further 5FU injections or bleb needling in approximately 75% of patients. With extra drops and/or needling or 5-FU injections adequate IOP control was obtained in nearly all patients. The rise in IOP at 12 months was statistically significant.

Conclusion: In the majority of patients, good IOP control was achieved with the use of 5-FU immediately after cataract surgery. Although adjunctive treatment was required in a quarter of patients, there were no adverse events directly associated with the use of 5-FU.

P616 THE LONG-TERM SUCCESS IN CONTROL OF INTRAOCULAR PRESSURE IN GLAUCOMA PATIENTS UNDERGOING COMBINED CATARACT AND GLAUCOMA SURGERY

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Background: Previous studies showed the success of single site/ double site combined cataract & glaucoma filtering surgery in patients with cataract and medically controlled and uncontrolled glaucomas.

The objective of this study is to determine the Long-term (up to 5 years) IOP Lowering effect of the single-site cataract and glaucoma filtering combined surgery.

Methods: A retrospective study of 66 patients (Pts) (89 eyes) classified by race, gender and age, with an established diagnosis of POAG and cataract who underwent combined single site cataract and glaucoma filtering surgery were analyzed. 34 males: 55 females; 43 one eye (43) and 23 both (46) eyes were in the study. The preoperative BCVA, IOPs, No. of meds were documented and analyzed. Success of the surgery is defined IOP < 21 mmHg complete with no meds and qualified with meds results 48 Caucasians (CW), 29 African Americans (AA), 3 Asians and 9 Hispanic patients were analyzed, mean follow-up was 49.9 months (24-66 months), 89 (24 months), 81 (36 months), 71 (48 months), 51 (60 months) & 13 (60+ months). Pre-op BCVAs 20/30-20/40: 17 eyes, 20/50-20/200: 63 eyes, 20/400-20/HM: 9 eyes. Post-op BCVAs 20/20-20/40: 62 eyes, 20/50-20/200: 21 eyes, & 20/400-20/HM 6 eyes showing significant improvement in BCVAs; pre-op IOPs mean 19.4 mmHg (10-47) post-op mean IOPs 15.9 (8-28) with significant reduction ($p = 0.01$) AAs 18.2 to 16.3 vs CWs 20.1 to 15.7 pre-op no. of meds: 1.46 vs post-op meds 0.46 ($p = 0.01$); 62/89 on 0 meds, 16/89 on 1 meds, 11/89 on 2 meds showing significant reduction in post of meds. AAs 1.55 to 0.72 vs CW 1.33 to 0.29 meds. post op IOPs < 18: 68/89 (76%), < 15: 42/89 (47%) vs < 12: 15/89 (16%).

Conclusions: This 24-66 month long-term follow-up combined cataract and filtering surgery showed high success rates. 62/89 (69%) complete successes vs 21/89 (24%) qualified successes. 68/89 (76%) : < 18 mmHg; 42/89 (47%) < 15 mmHg IOP and 15/89 (17%) < 12 mmHg.

P617 SURGICAL OUTCOMES OF COMBINED TRABECULECTOMY AND DISLOCATED POSTERIOR CHAMBER INTRAOCULAR LENS EXCHANGE

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Background: Recent developments in cataract surgery now allows for the intraocular lens (IOL) to be safely fixed into the capsular bag even though the zonular vulnerability exists. However, the longevity of the lives of some patients sometimes causes IOL dislocation, thus requiring those patients to undergo further glaucoma surgery. The purpose of this present study is to report the simultaneous surgical outcomes of combined trabeculectomy and IOL exchange for glaucoma patients with a dislocated IOL.

Methods: Seven cases of IOL dislocation and uncontrollable intraocular pressure (IOP) who received combined trabeculectomy and IOL exchange from January 2005 to October 2010 were retrospectively reviewed. This study involved 3 males and 4 females with a mean age of 81.9 ± 8.3 years. For each patient, a 240-degree fornix-based conjunctival incision was made in the associated eye, and a 3mm x 6mm paddle-shaped scleral flap was then made on the superior temporal portion. After a 3-minute application of 0.04% mitomycin C, the dislocated IOL was extracted and a new IOL was fixed onto the sclera at the 2- and 8-, or 4- and 10-o'clock

position after anterior vitrectomy. A second deep scleral flap accompanied with trabecular meshwork was then excised, and a peripheral iridectomy and suturing of the scleral flap and conjunctiva with 10-0 nylon suture were performed.

Results: All cases except one showed pseudoexfoliation glaucoma. The exceptional case had a previous history of an acute angle-closure glaucoma attack. The mean time periods from the previous cataract surgery were 84.0 ± 50.6 months, and IOP decreased significantly from 31.7 ± 7.6 mmHg preoperatively to 13.4 ± 6.3 mmHg at the time of the final follow-up visit. There were no severe complications associated with this surgery in all cases.

Conclusion: Although simultaneous combined trabeculectomy and IOL exchange was a complicated and time-consuming procedure, this procedure proved to be both safe and effective and is less invasive to the conjunctivae than when performing these procedures sequentially.

P618 ABSTRACT WITHDRAWN

P619 ACCURACY OF SPHERICAL EQUIVALENT PREDICTION IN PATIENTS RECEIVING COMBINED PHACOTRABECULECTOMY

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Background: We aimed to compare the actual and predicted post-operative spherical equivalent (SE) following combined phacoemulsification, intraocular lens (IOL) implantation and two-sited, limbal-based trabeculectomy between two groups of patients, namely primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG).

Methods: We performed a retrospective analysis of 43 consecutive patients (1 eye for each patient) who had undergone uncomplicated phacoemulsification, IOL implantation and two-sited, limbal-based trabeculectomy. 24 patients (13 male) had POAG and 19 patients (7 male) had PACG. The biometry prediction error was determined by the difference between actual and predicted post-operative SE, at least 3 months after operation. The mean biometry prediction error, proportion of patients with prediction error > 0.50 D or 1.00 D (either myopic or hyperopic shift) were comparatively analyzed. A single type of IOL was used and all measurements were performed by qualified optometrists.

Results: The mean biometry prediction error of POAG and PACG groups of patients were 0.56 D and 1.00 D ($p = 0.01$). For myopic shift > 0.50 D, the range of prediction error varied from $0.56 - 1.59$ D (POAG group) and $0.52 - 2.05$ D (PACG group), respectively. Hyperopic shift > 0.50 D was much less frequent. The proportion of patients with myopic shift > 0.50 D or 1.00 D were 37.5% or 12.5% for POAG group, and 73.7% or 31.6% for PACG group ($p = 0.04$ for > 0.50 D, $p = 0.25$ for > 1.00 D). There was no significant difference between groups regarding hyperopic shift. No significant differences were found between groups with regard to age, sex, baseline mean deviation by Humphrey visual field, pre-operative and post-operative best-corrected visual acuity, pre-operative intraocular pressure (IOP) and post-operative IOP control.

Conclusion: A significantly higher biometry prediction error, and a more likelihood of myopic shift > 0.50 D were observed in PACG patients following phacotrabeculectomy. We pos-

tulate the post-operative anterior chamber depth and anterior segment structures differences (e.g. presence of peripheral anterior synechiae, position of iris-lens capsule-IOL complex) might account for such observation. Traditional IOL regression formulae might not be suitable in such context.

P620 PHACOEMULSIFICATION CATARACT IN PATIENTS WITH PSEUDOEXFOLIATION AND SMALL PUPIL

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Purpose: To evaluate the outcome of phacoemulsification and trabeculectomy in eyes with subluxated cataract and small pupils, as seen in eyes with pseudoexfoliation. Methods and measures: Visual acuity (VA), mean IOP before and after surgery, postoperative IOL position and complications. Pseudoexfoliative syndrome was more frequent in people over 70. This retrospective study comprised 33 eyes of 32 patients with poor zonular support and narrow pupils. Cataract surgery was performed in 24 eyes and combined trabeculectomy on 9 eyes. Mean follow up was 3 months.

Result: Mean visual acuity postoperatively was significantly higher than preoperatively. Mean IOP in the cataract alone group was similar pre and postoperatively (11.6 and 11.7 mmHg respectively). The IOP in the combined trabeculectomy group was 16.3 preoperatively and 9.76 mmHg postoperatively ($p < 0.01$). As for complication 4 eyes required and anterior vitrectomy. Fibrin in the anterior chamber was found in 6 eyes (12%) postoperatively.

Conclusion: The presence of pseudoexfoliation increased the risk of intraoperative complications when extracting the cataract and the lens, either because of poor dilatation of the pupil or the structure of the zonula. This study shows significant improvement in visual acuity in IOP decreases in trabeculectomy group and a low rate of complication.

P621 SURGICAL TREATMENT AND PATIENT PERCEIVED BENEFIT OF CO-EXISTENT ADVANCED OR END-STAGE GLAUCOMA WITH CONTROLLED INTRAOCULAR PRESSURE AND VISUALLY SIGNIFICANT CATARACT

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Background: it is estimated that cataract surgery alone has a beneficial effect by mildly lowering the intraocular pressure. However, it is possible that even temporary loss of intraocular pressure (IOP) control may occur after cataract operation. This event may be of utmost importance in eyes with already severely compromised optic nerves. Even more, there is a question of patient perceived benefit of an operation in an eye with poor visual prognosis given the seriously damaged optic nerve. The purpose of the study is to investigate the surgical results in relation of patient perceived benefit of two surgical alternatives: phaco only versus combined phaco trab operation in eyes with advanced or end stage glaucoma.

Methods: Prospective study of 73 patients with advanced or

end-stage open-angle glaucoma with IOP ≤ 21 mmHg on topical medication and visually significant cataract (VA ranging from Hand Movements to 4/10). All patients were randomized to have either combined surgery (phaco-trab) (Group A, 36 eyes) or phaco only (Group B, 37 eyes). Follow up for 6 months. Main outcome measures: 1) Visual Acuity (VA) at 1, 3 and 6 months postoperatively. 2) Visual Fields test (VF) at 1, 3 and 6 months postop 3) IOP at 1st, 4th and 7th day post-op, weekly thereafter until the end of the second month and monthly afterwards until the end of follow up period. 4) National Eye Institute Visually Functioning Questionnaire-25 (VFQ-25) was filled-in before and 6 months after the operation. Appropriate pressure lowering medication was given whenever the IOP was found to exceed the '21 mmHg' barrier.

Results: all patients experienced improvement of VA (post-operative VA 1/10-10/10). In Group A IOPs were lower by 4 mmHg (range 3-10) and this difference was consistent during the whole follow up period. However, the White on White Automated Perimetry did not reveal progression of glaucoma lesions in either Group.

In VFQ-25 questionnaire there was significant correlation of patient perceived benefit to the final postoperative visual acuity and this effect was more prominent in one-eye patients or when the postoperative VA was superior to the VA in the fellow eye.

Conclusion: Higher IOPs postoperatively in phaco only patients do not seem to affect glaucoma lesions, provided that close IOP monitoring and treatment are taking place, as far as the first six months' postoperative period is concerned. However patients should have detailed preoperative consultation related to the objectives of either surgical procedure given the poor visual prognosis of these eyes.

P622 MICS-MICROTRAB: MICROINCISION BIMANUAL PHACO-MICROTRABECULECTOMY FOR MINIMAL INVASIVE COMBINED SURGERY

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Background: We combined microincision bimanual phacoemulsification with microtrabeculectomy, a technique which we call MICS-MicroTrab. We describe the surgical technique and test its efficacy and safety in a case-control study.

Patients and Methods: 18 consecutive patients with cataract and primary open-angle glaucoma (POAG) were enrolled. 18 patients with POAG requiring only filtering surgery underwent microtrabeculectomy by the same surgeon and served as controls. Mitomycin C (0.2 mg/ml) was applied in every case. In MICS-MicroTrab, phacoemulsification and intraocular lens implantation were performed through clear corneal incisions (max 1.8 mm wide) away from the trabeculectomy-flap. The primary outcome measure was intraocular pressure (IOP) 12 months postoperatively. Secondary measures were number of glaucoma medications, visual acuity, intra- and postoperative complications, number of laser suture lyses, needlings and injections of 5-fluorouracil.

Results: Mean IOP significantly decreased postoperatively in both groups (baseline IOP: 22.72 ± 5.57 mmHg in MICS-MicroTrab and 23.83 ± 5.92 mmHg in controls; 12 months postoperatively: 10.17 ± 2.53 and 11.22 ± 5.04 mmHg, respectively). Mean IOP decrease was similar in both treat-

ment groups (-13.61 ± 5.72 vs -13.39 ± 5.19 mmHg, $p = 0.903$). The number of anti-glaucoma agents dropped from 2.33 and 2.94 (range 1-4) to 0 postoperatively. Visual acuity was significantly improved one year after MICS-MicroTrab, and decreased after microtrabeculectomy ($P < 0.005$). No severe complications were observed either intra- or postoperatively.

Conclusions: In patients with coexisting cataract and glaucoma, MICS-MicroTrab is a safe and efficient method of combining both procedures by using minimal invasive surgical techniques.

P623 ABSTRACT WITHDRAWN

P624 PHACO-DEEP SCLERECTOMY WITH MITOMYCIN C VERSUS PHACO-TRABECULECTOMY IN PATIENTS WITH COEXISTING CATARACT AND GLAUCOMA

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Background: Although trabeculectomy is currently regarded as the standard surgical procedure combined with cataract surgery, it can cause undesirable postoperative complications including hyphema, excessive filtration leading to shallow or flat anterior chamber, choroidal detachment, hypotony maculopathy, suprachoroidal hemorrhage, bleb-related problems, and increased risk of endophthalmitis. Non-penetrating glaucoma surgery, including deep sclerectomy, is a viable alternative to trabeculectomy with advantages of decreased postoperative complications. This procedure can be combined with phacoemulsification in managing patients with coexisting cataract and glaucoma with very satisfactory results with regard to visual outcome and IOP control.

Methods: Fifty eyes of thirty-eight patients diagnosed with senile cataract and primary open-angle glaucoma were divided into two equal groups. Group A underwent Phaco-deep sclerectomy (P-DS) with mitomycin C (MMC) while group B underwent phaco-trabeculectomy (P-T). Phacoemulsification was done first followed by the glaucoma operation in different two sites. Postoperative IOP was followed up for six months. Cases were examined first and second day postoperatively then weekly during the first post-operative month then monthly for six months.

Results: By the end of the sixth month, the IOP ranged from 12.0 to 24.0 mmHg with a mean of 15.36 ± 3.27 mmHg in group A and 11.0 to 25.0 mmHg with a mean of 15.46 ± 2.78 mmHg in group B without a statistically significant difference between the two groups ($p = 0.90$). By the end of the sixth month complete success (IOP < 21 mmHg without anti-glaucoma therapy) was achieved in 80% in group A and 84% in group B. By the end of the sixth month qualified or partial success (IOP < 21 mmHg with anti-glaucoma therapy) was achieved in 12% in both groups A and B. At the end of the six post operative month, BCVA rang was 1/60 to 6/6 with a mean of 0.655 ± 0.306 in group A and 1/60 to 6/6 with a mean of 0.662 ± 0.297 in group B without a statistically significant difference between the two groups ($p = 0.93$). At the end of follow up period, five patients (three in group A & two in group B) had mild (less than 6/60) improvement of best corrected visual acuity than the preoperative level due to advanced glaucomatous damage. Visual acuity results were not related to the surgery. No patients had deterioration of visual acuity level.

Conclusion: P-DS with MMC does not exceed conventional P-T in what concerns IOP reduction. However the complication rate is lower in P-DS. Augmentation of PDS with MMC is safe with few serious complications related to its use and MMC augmentation appears to increase the probability of achieving lower target intraocular pressures after combined P-DS. Our results in what concern control of IOP, recovery of vision and absence of severe complications lead us to further enthusiasm considering combined P-DS with MMC in this type of patients. Further broader studies, with long term and improved follow-up may assist in further evaluating the efficacy of this combined surgical technique.

P625 LONG-TERM OUTCOMES OF PHACOTRABECULECTOMY SURGERY WITH ANTI-METABOLITE USE

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Background: Combined cataract and glaucoma surgery has definite advantages in the elderly population since it addresses two problems in one surgical procedure. However, phacotrabeculectomy is generally perceived less successful than trabeculectomy and carry a higher rate of complications than the latter. We present the outcomes of phacotrabeculectomy procedure including a long-term follow up of more than 5 years.

Methods: A retrospective review of 41 cases of phacotrabeculectomy was performed in two hospital sites in the United Kingdom. All surgeries were performed by a single surgeon employing two site technique in all cases using anti-metabolite mitomycin-C (MMC) or 5 Fluorouracil (5FU). All of the patients have completed at least 1 year follow up.

Results: All the patients were Caucasian whites; 15 were male and 22 were females. Average age of the patients was 78.33. Of the 41 eyes, 32 had open-angle glaucoma and the rest had closed angles or other etiologies. MMC was used in 39 cases and 5-FU was used in 3 cases. Coexisting pathology affecting vision was present in 14 cases. Mean pre-op Intraocular pressure (IOP) was 21.53 mmHg and post-op mean IOP at 1 year was 13.93 mmHg. Mean IOP at 5-year follow up for the available data (11 cases) was 11 mmHg. Five cases showed average IOP of 10 mmHg after more than 5 years follow up. Pre and post-op Visual acuity (VA) data was available in 39 cases. Preoperatively 10 cases had VA of worse or equal to 6/60, 17 cases had between 6/36 and 6/18, and 12 cases had VA better than 6/18. Postoperative VA was worse than or equal to 6/60 in 4 cases; all of them had other retinal pathology like ARMD or vein occlusion. Post-op VA was in between 6/36 and 6/18 in 7 cases, and better than 6/18 in 28 cases. Transient hypotony following surgery occurred in 6 cases, and conjunctival leaks requiring resuturing happened in 4 cases. No sight threatening complications were noticed in this series.

Conclusion: MMC augmented two-site phacotrabeculectomy is an effective procedure in elderly population. With careful follow up and appropriate intervention, it offers long-term reduction of IOP and improves vision.

Surgical Treatment: Combined Glaucoma and Retinal or Corneal Surgery

P626 GLAUCOMA MANAGEMENT IN PATIENTS RECEIVING TYPE I BOSTON KERATOPROSTHESES

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Background: Glaucoma is prevalent and remains a visual limiting factor in eyes with keratoprotheses (KPro). We have reviewed the records of patients at our institution receiving KPro to determine the scope of the problem and to assess the incidence of post operative pressure elevation that requires treatment.

Methods: A retrospective case series was created by reviewing the records of all patients who had KPro placement at our institution.

Results: Type I Boston KPro were placed in 70 eyes of 67 patients (mean follow-up of 14.7 ± 11.4 months). There were 49 eyes with pre-existing glaucoma and 21 eyes with no pre-existing glaucoma (Group Control). Of eyes with pre-existing glaucoma, 20 eyes had previous shunts or shunt revision/ placement at the time of KPro placement (Group Shunt), whereas 29 eyes had no shunts (Group No Shunt). During the follow up period, treatment for pressure elevation was needed in 40% (8/20) in Group Shunt, 66% (19/29) in Group No Shunt, and 29% (5/21) in Group Control. Treatment for pressure elevation included 1 eye with diode and 7 eyes with additional medications in Group Shunt; 1 eye with diode and 18 eyes with additional medication in Group No Shunt; and 1 eye with subsequent shunt and 4 eyes with additional medication in Group Control.

Conclusions: A large majority of patients requiring KPro placement have pre-existing glaucoma and post-operative pressure elevation. Previous shunts or shunt revision/ placement at the time of KPro can be helpful to decrease the incidence of post-operative pressure problems that require treatment. A significant number of patients with no pre-existing glaucoma develop post operative pressure elevation requiring treatment; however the pressure can be successfully controlled with medication in most eyes.

P627 COMPARISON OF OUTCOMES OF TRABECULECTOMY AFTER DESCMET'S STRIPPING AUTOMATED ENDOTHELIAL KERATOPLASTY (DSAEK) VERSUS PENETRATING KERATOPLASTY (PK)

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Background: To compare the outcomes of trabeculectomy after Descemet's stripping automated endothelial keratoplasty (DSAEK) versus trabeculectomy after penetrating keratoplasty (PK).

Methods: Patients with secondary glaucoma developing after corneal graft surgery, who underwent trabeculectomy with mitomycin C (MMC) were retrospectively reviewed. Eighteen patients with trabeculectomy after DSAEK (cases) and 20 patients with trabeculectomy after PK (controls) were analyzed. The main outcome measure was bleb survival at 6

months after trabeculectomy. A successful outcome was defined as intraocular pressure (IOP) ≤ 21 mmHg without anti-glaucoma medications, qualified success was defined as IOP ≤ 21 mmHg with anti-glaucoma medications, and a failed outcome was defined as IOP > 21 mmHg or if other interventions were required (eg. bleb needling with 5-fluorouracil [5-FU] or further glaucoma surgery). The incidence of complications related to trabeculectomy and corneal graft surgery was also studied.

Results: Comparing cases vs controls, there was no difference in pre-trabeculectomy IOP between both groups (35.3 ± 9.9 vs 34.1 ± 8.8 , $p = 0.70$). At 6 months after trabeculectomy, there was no difference in mean IOP between cases and controls (13.6 ± 7.0 vs 15.0 ± 6.5 , $p = 0.54$). Successful outcomes were achieved in 72.2% ($n = 13$) of cases vs 65.0% ($n = 13$) of controls ($p = 0.73$). A failed outcome was seen in 22.2% ($n = 4$) of cases vs 30.0% ($n = 6$) of controls ($p = 0.72$). Corneal graft failure was seen in 5.5% ($n = 1$) of cases and in 20.0% ($n = 4$) of controls ($p = 0.34$); in the latter group, 1 patient had pre-existing corneal graft failure before trabeculectomy. One patient in the control group required a repeat trabeculectomy within 6 months due to bleb failure and uncontrollable IOP despite re-instatement of anti-glaucoma medications, and repeated bleb needling with 5-FU.

Conclusion: The outcomes of trabeculectomy after DSAEK and after PK are comparable in terms of bleb success and failure at 6 months. There was no difference in incidence of complications during this early post-operative period.

P628 LOOK, LISTEN AND LEARN: SURGICAL TECHNIQUE OF SIMULTANEOUS BOSTON KERATOPROSTHESIS WITH AGV WITH PARS PLANA VITRECTOMY (PPV)

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Video: Two experienced senior surgeons one each from cornea and glaucoma departments perform this challenging K-Pro Triple combined surgery. This video shows briefly steps of Boston keratoprosthesis performed individually with tremendous success. It then highlights steps of Ahmed Glaucoma Valve (AGV) in various situations. Video then stresses on one unique surgery requiring 20 gauge three port Pars Plana Vitrectomy (PPV) in combination with Boston keratoprosthesis and AGV implantation in the same eye in the same sitting and his story.

P629 COMBINATION THERAPY IN NEOVASCULAR GLAUCOMA

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Background: Neovascular glaucoma (NG) is a challenging pathology and is very difficult to manage. The surgical approaches are highly invasive, leading to a high rate of complications since the affected eyes are very prone to inflammation and hemorrhage. The objective of this study is to evaluate the efficacy and safety profile of the combination therapy with modified filtration surgery (Ex-PRESS® minis-

hunt), preceded by subconjunctival injection of bevacizumab (SCIB) for neovascular glaucoma.

Methods: 30 eyes with NG were subject to SCIB (0.3 mL, 1.25 mg / 0.05 ml), followed by modified filtration surgery with an Ex-PRESS® minishunt 10 days afterwards. Panretinal photocoagulation was performed after IOP was under control.

Results: The mean baseline intra-ocular pressure (IOP) was 51mmHg (44-66 mmHg); at 9 months follow-up the IOP was 20 mmHg (12-34 mmHg). No local or systemic adverse events were noted.

Conclusion: The combination of the minimally invasive techniques applied appears to be effective and safe in controlling IOP in NG.

P630 MASOUD BALLOON (NANO-SILICON AND NANO-SILVER) TO TREATMENT AND AVOID GLAUCOMA AND POSTOPERATIVE COMPLICATIONS AFTER VITREO-RETINAL SURGERY (MANAGEMENT OF GLAUCOMA)

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Purpose: To treat and avoid glaucoma and postoperative complications with intraocular nano-silicon balloon (anti-virus, antibacterial, anti-fungus) after vitrectomy in aphakic and pseudophakic eyes with macula hole in retinal detachment.

Methods: After vitrectomy the syringe with silicon oil. With fixed nano-silicon bubble (anti virus, antibacterial, with treatment drugs) on it (v.4-6 mm). Injected through ora serrata into vitreous cavity. Then we filled the bubble with oil or (N-saline) up to normal pressure and fixed on sclera. Upon total retina attachment to choroidea silicon oil or (N-saline) with bubble should be simultaneously removed in (1-3) month after surgery.

Result: injection of nano-silicon bubble (in addition to nano-silver) (v. 4-6 mm) with silicon oil in vitreous cavity creates conditions where oil dose not penetrated anywhere A-Does not get to anterior chamber and contact with corneal epithelial layer B-to vessels D-oil does not get through valves, and holes behind the retina. E-interferes to penetration of oil into the ciliary body and prevents closing of a space for coming of liquid regulating IOP .and prevents closing Schlemm's canal. And anti-microbial system nano-silver avoids postoperative complication and has a treatment retinoblastoma with anticancer Property leading the drugs polymering.

Conclusion: This method help to provides total retinal attachment to choroidea and treatment and avoid a post operative complication.

Surgical Treatment: Wound Healing And Devices or Drugs to Enhance Bleb Formation

P631 CLINICAL AND FUNCTIONAL EVALUATION OF COLLAGEN IMPLANT APPLICATION IN PRIMARY OPEN-ANGLE GLAUCOMA SURGERY

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Background: Surgical intervention induces the process of tissue regeneration that leads to an excessive scarring in conditions of anti-proliferative factors deficit. Different implants are used to prevent this complication. The results of clinical trials demonstrate insufficient efficiency of implants application due to the local inflammatory process and encapsulation. Disbalance of cytokines leads to the excessive proliferation. This determines the search of methods that can regulate the wound healing response in order to prevent an excessive scarring after glaucoma surgery.

Methods: The patients with primary open-angle glaucoma underwent non penetrating glaucoma surgery and were divided into 2 groups: the first group (80 eyes) – with the placement of collagen implant (CI) device with cytokines; the second group (74 eyes) – with standard surgical technique using collagen implant device without cytokines. Complex experimental, clinical and laboratory investigations were performed before operation and postoperatively. The concentrations of IL-1 β cytokine and TGF- β 2 in lachrymal fluid were studied by immunological methods.

Results: Immunological investigations of lachrymal fluid revealed the decrease of pro-inflammatory cytokine IL-1 β and TGF- β 2 in the first group. Increasing concentration of TGF- β 2, that stimulates proliferative activity and excessive scarring, was determined in the second group. Clinical trials have demonstrated a stable hypotensive effect. Scanning investigations showed a functional activity of surgically formed pathways. In the case of standard method (the second group) a filling of intrascleral cavity by neoplastic tissue, adhesion of CI with sclera was revealed. As a result, ophthalmotonus decompensation with low tonographic data was observed.

Conclusions: Collagen implants (CI) with cytokines promotes a decrease of inflammatory activity, suppress the excessive fibroblastic tissue response, prevents from encapsulation and development of scarring formation around the implant.

P632 THE EFFECT OF COMBINED PHOTODYNAMIC THERAPY WITH BCECF-AM AND GLAUCOMA FILTERING SURGERY IN CONTROLLING POSTOPERATIVE INTRAOCULAR PRESSURE

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Background: Postoperative scarring of the filtering bleb is the most crucial factor in determining the outcome of modern glaucoma filtration surgery. Various methods have been investigated to avoid the naturally occurring scarring of the bleb, mostly dealing with the intraoperative or postoperative application of antimetabolic drugs. BCECF-AM (2, 7-bis-(2-carboxyethyl) -5- (and -6) -carboxyfluorescein, acetoxymethyl-ester) is an intracellular locally acting photosensitizer. Its effect is strictly limited to the area illuminated by blue light.

Methods: This study was conducted upon 30 glaucomatous patients, 20 (66.7%) cases were primary open-angle glaucoma, 4 (13.3%) cases were pseudoexfoliation glaucoma, 3 cases (10%) were chronic angle-closure glaucoma, and 3 (10%) cases were neovascular glaucoma. In all eyes, IOP was not controlled despite maximum tolerable topical and systemic anti-glaucoma therapy. The applied samples of the photosensitizer were provided by *Sigma-Aldrich* as BCECF-

AM ester 1 mg/ml in DMSO. Patients were reviewed 2 weeks and 1, 3, 6, and 12 months after surgery, for V/A, slit lamp examination, IOP, Fundus examination, Photo documentation with UBM. The results are expressed in terms of *Efficacy, complete success, qualified success, failed*. The interval between surgery and the UBM examination was one month. The clinical safety and tolerability was represented by lack of signs of local toxicity, intraocular inflammation, and any discomfort for the patient.

Results: Mean age of the patients was 52.07 (± 7.06), with a range of 40-65 years. As regards to the type of the glaucoma, 20 (66.7%) cases were primary open-angle glaucoma, 4 (13.3%) cases were pseudoexfoliation glaucoma, 3 cases (10%) were chronic angle-closure glaucoma and 3 (10%) cases were neovascular glaucoma. No significant complications were seen in this study. The mean IOP during the first postoperative days was 10.5 (± 4.54) mmHg. After a mean follow up of 10.7 months (range 3-12 months), out of the 30 eyes, 18 eyes (60%) showed complete success, 8 eyes (26.7%) showed qualified success, and 4 eyes (13.3%) failed due to scarring after 2-48 weeks. The postoperative reduction in IOP in the eyes resembling complete success proved to be significant by $p < 0.0001$ in the two tailed Student's *t*. There is a statistical significant difference in the Mean and standard of deviation between preoperative and postoperative IOP (p value < 0.0001).

Conclusion: Cellular photoablation seems to be a safe and effective therapeutic approach to control postoperative fibrosis in human glaucomatous eyes, but with a limited surgical prognosis. Multiple factors such as light dose, wavelength, irradiation area, and multiple dosing may be altered in the future to improve the antifibrotic effect during glaucoma surgery. Further studies are necessary to optimize the safety and the reliability in the future.

P633 RESULTS OF NON-PENETRATING FILTERING SURGERY USING HEALAFLOW

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Background: To evaluate the efficacy and safety profile of a slow resorbable drainage implant in deep sclerectomy and viscocanalostomy for the surgical treatment of glaucoma.

Methods: Classical deep sclerectomy and viscocanalostomy were performed in 2 clinical centers in Switzerland between April 2008 and March 2010. For both groups the main diagnoses were primary open-angle glaucoma, primary angle-closure glaucoma and pseudoexfoliation. For the deep sclerectomy group, the implant (Healaf^{low}) was inserted onto the scleral bed ($< 100 \mu$ l) to act as a space maintainer and under the conjunctiva ($\sim 400 \mu$ l) to prevent fibrosis. For the viscocanalostomy group the ostia of Schlemm's canal were opened using standard high molecular weight viscoelastics, then Healaf^{low} was inserted onto the scleral bed and under the conjunctiva similarly to deep sclerectomy. The outcomes were the intraocular pressure (IOP), the number of anti-glaucoma medication, and the number of complications.

Results: For the deep sclerectomy group the mean age at surgery was 65.3 ± 15.6 years, the mean follow-up for the 90 patients was 19.8 ± 4.5 months, the mean preoperative IOP was 22.0 ± 7.2 mmHg, and the mean number of anti-glau-

coma medication was 2.7 ± 0.9 . At final follow-up visits, the mean IOP was 12.3 ± 3.1 mmHg, the mean number of anti-glaucoma medication was 0.3 ± 0.8 , with 11 complications. The overall success rate was 95% (IOP ≤ 18 mmHg with/without medication), and the complete success rate was 81% (IOP ≤ 18 mmHg without medication). For the viscocanalostomy group the mean age at surgery was 73.2 ± 10.2 years, the mean follow-up for the 51 patients was 20.7 ± 4.9 months, the mean preoperative IOP was 21.0 ± 5.3 mmHg, and the mean number of anti-glaucoma medication was 2.8 ± 0.9 . At final follow-up visits, the mean IOP was 12.4 ± 1.9 mmHg, the mean number of anti-glaucoma medication was 0.2 ± 0.6 , with 2 complications. The overall success rate was 94% (IOP ≤ 18 mmHg with/without medication), and the complete success rate was 86% (IOP ≤ 18 mmHg without medication).

Conclusion: The slow resorbable highly cross-linked sodium hyaluronate drainage implant prevents the postoperative filtering bleb fibrosis and helps in maintaining a functional filtration after glaucoma surgery. The IOP was significantly lowered with a few numbers of postoperative complications and less medication.

P634 THREE-YEARS FOLLOW-UP OF TRABECULECTOMY WITH BIODEGRADABLE 3D POROUS COLLAGEN-GLYCOSAMINOGLYCAN SCAFFOLD FOR TREATMENT OF REFRACTORY GLAUCOMA

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Background: Based on experience learned from earlier animal study, we describe a pilot study that evaluates the safety and efficacy of trabeculectomy with implantation of Biodegradable Collagen Matrix (BCM) in refractory glaucoma patients. Biodegradable Collagen Matrix, by its characteristics, improves the regenerating tissue-remodeling and reduces scar formation by guiding fibroblast to grow through the matrix pores randomly.

Methods: In this prospective and non-randomized study, 9 patients (M:5, F:4, age: 54.4 ± 10.4 yrs) underwent trabeculectomy with new device in one eye for refractory glaucoma, which is defined as having previously failed medical, laser or surgical treatment, or some combination thereof. Biodegradable Collagen Matrix was implanted on the top of the scleral flap at the limbus before closing the conjunctival wound during trabeculectomy operations. Intraocular pressure (IOP), number of medications and complication were assessed before and after surgery.

Results: The mean preoperative IOP was 41.2 ± 6.5 mmHg with 2.3 ± 0.5 anti-glaucoma medications. Postoperatively, the mean IOP at last follow up (36 months) was 17.4 ± 2.1 mmHg (57.7% reduction, $p < 0.01$) with 0.8 ± 0.5 anti-glaucoma medications. There were no significant intra-operative complications in any patients. Post-operative complications including transient shallow anterior chamber, hyphema, choroidal detachment and hypotony, no endophthalmitis occurred in any patients. **Conclusion:** Results suggest that this procedure represents a safe, simple, and effective therapeutic approach for treating refractory glaucoma.

P635 ANTIFIBROTIC EFFECT OF 'SB 202190', A HIGHLY SELECTIVE INHIBITOR OF P38 MAP KINASE, ON SCAR FORMATION AFTER GLAUCOMA SURGERY

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Background: A major problem of surgical glaucoma therapy lies in the postoperative scarring process. The cytokine transforming growth factor- β (TGF- β) is a pivotal contributor to tissue fibrosis. Members of the mitogen activated protein kinase (MAPK) signaling cascades are stimulated by TGF- β and are one of the fibrosis interplayers. SB 202190 is a highly selective, potent and cell permeable inhibitor of p38 MAPK. The aim of this study is to explore the antifibrotic effects of SB 202190 on scar formation after glaucoma filtering surgery in rabbits.

Methods: The half maximal inhibitory concentration (IC₅₀) of SB 202190 in the human tenon's fibroblast proliferation was determined by XTT test. On 20 chinchilla rabbits (ChB-BCH), glaucoma filtration surgery similar to clinical practice, was performed. The animals received either no adjuvant 'GI'; the vehicle alone 'GII' or SB 202190 (20 μ mol 'GIII' or 50 μ mol 'GIV'). The drug was applied intraoperative under the conjunctiva and the scleral flap followed by unilateral subconjunctival injections at the 1st, 3rd and 7th post-operative days. The bleb was scored with the Indiana Bleb Appearance Grading Scale. The difference in measured intraocular pressure 'IOP' was expressed as the right-to-left (R/L) eye ratio. The animals were sacrificed on day 14 and the eyes processed for histology and immunohistochemical staining for alpha smooth muscle actin (α -SMA).

Results: Bleb scoring revealed a significantly increased bleb height and extension at day 14 in 'GIII' only compared to control, ($p = 0.008$, Mann Whitney test). As well, the duration of the bleb survival was significantly prolonged compared to control 'GI', ($p = 0.002$, Kaplan-Meier log rank test) with increased transparency of the subconjunctival tissue and suppressed scarring. Increasing the dose to 50 μ mol 'GIV' did not improve the bleb survival compared to 'GIII', ($p = 0.688$, Kaplan-Meier log rank test) and was associated with delayed post operative hyphema that typically developed by the 2nd day following the 1st injection. In addition, internal bleb haemorrhage occurred in 3 rabbits. In all groups, the IOP ratio correlated with the fibrotic process. Only 'GIII' showed a significantly reduced IOP ratio at day 14 compared to control ($p = 0.009$, Mann Whitney test) that was associated with milder subconjunctival fibrotic reaction according to the histological and immunohistochemical analysis.

Conclusions: Under the conditions of this study, SB 202190 at 20 μ mol concentration significantly reduced conjunctival scarring and improved surgical outcome of this rabbit glaucoma filtering model. At 50 μ mol concentration, an increased risk of bleeding tendency was present that might hinder further outcome improvement.

P636 CLINICAL EXPERIENCE OF MITOMYCIN-C SOAKED COLLAGEN MATRIX IMPLANT IN TRABECULECTOMY

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Background: To assess the surgical outcomes and the wound healing reaction of the filtering bleb after trabeculectomy with Mitomycin-C soaked biodegradable collagen matrix (Ologen®) using ultrasound biomicroscopic images.

Methods: After trabeculectomy with Mitomycin-C (0.02%, 0.1 ml) soaked Ologen® implanted on the top of the scleral flap under the conjunctiva, the filtering blebs of 30 eyes with glaucoma uncontrolled with medication and laser treatment were assessed by ultrasound biomicroscope. Bleb morphology and vascularity were evaluated with Moorfield bleb grading system, and other surgical outcomes including complications were also assessed at 1 day, 1 week, 2 weeks, 1 month, 2 months, 3 months, 6 months, and 12 months after surgery.

Results: Preoperative IOP was 35.6 ± 11.2 mmHg (mean \pm SD) with 3.7 ± 0.7 anti-glaucoma medications. Postoperative IOP was 12.9 ± 4.0 mmHg ($p = 0.00$ paired t test) with 0.2 ± 0.7 anti-glaucoma medications at last follow up ($p = 0.00$ paired t test). Encysted bleb was the most common complication (9 eyes) and generally occurred from 2 weeks after surgery. There was not any avascular bleb at last follow-up. After 12 months, the mean center score of bleb area was 2.41, the mean maximal score was 3.28, the mean bleb height score was 2.10, and the mean center, maximal, and no-bleb scores of vascularity were 1.17, 1.93, and 1.96 respectively.

Conclusion: Mitomycin C soaked collagen matrix implant in trabeculectomy showed comparatively stable intraocular pressure and prevention effect against avascular blebs and did not display severe foreign body reaction in the subconjunctival space, and aggravate the wound healing or scar formation. The management of encysted bleb is issue for improving the success rate of surgery.

P637 CONJUNCTIVAL IMPLANTS TO REPAIR POST-TRABECULECTOMY BLEB HOLE(S)

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Background: Since the use of anti metabolites the blebs post-trabeculectomy have suffer different changes of the structure and behavior. Post op Seidel after bleb formation has become one of the common bleb problems, the presence of thin walls and posterior holes are the main causes. This technique has been used to repair bleb holes that can not be repair by displacement of the conjunctiva or by sutures.

Methods: We start to develop this technique in 2007 for patient with more than two surgeries for Pterygium. We found that the elasticity of the conjunctiva and its capability to expand and regenerate was useful to repair bleb holes; we did the first case in November 2007. The technique has two phases. Phase 1: The implantation of the conjunctiva Implant made of silicone next to the hole(s) area. After 3-4 weeks. Phase 2: Extraction of the conjunctiva implant and displacement of the new conjunctiva to the area of the hole(s). By now we have done 11 cases, 7 males 4 females average age is 55 years old, The entire group have bleb hole, the average time of the presence of the hole as a complication was 4 years.

Results: The successful was define as no Seidel and absence of a new hole in the surrounding area. The last control of the group we don't have new holes but we found a 2 cases with conjunctiva retraction. In 1 cases we have dehiscence of the sutures in the implant area but we manage with out any inconvenience to finish the healing process.

Conclusion: We found this technique very useful to this problems. Also is important to manage the periods using amniotic membrane during the first and some time the second phase of the procedure.

P638 PROTECTIVE EFFECT OF HONEYCOMB-PATTERNED FILM ON CONJUNCTIVAL DAMAGE IN EXPERIMENTAL FILTRATION SURGERY WITH MITOMYCIN C

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Background: The honeycomb-patterned film (HPF) is a biodegradable film made from poly(L-lactide-co-ε-caprolactone) with a honeycomb structure that allows tissue attachment on one side and a smooth structure that prevents adhesion on the other side. We have shown that HPF is effective to prevent scarring in an experimental filtration surgery in rabbits (Okuda et al. J Glaucoma 2009). The aim of this study is to examine whether HPF has a protective effect on the conjunctival damage in an experimental filtration surgery with mitomycin C (MMC) in rabbits.

Methods: An experimental filtration surgery was performed in 17 rabbit eyes (5 for control, 6 for MMC only, and 6 for MMC+HPF). The surgical procedures consisted of a fornix based conjunctival incision, creation of a 3x3 mm half-thickness scleral flap, application of MMC (0.4 mg/ml) for 2 minutes ($n = 12$), punch sclerostomy under the scleral flap, resection of the scleral flap, and conjunctival suture. A piece of HPF (6x6 mm, 14 μm thickness) was sutured over the sclerostomy site with the honeycomb side facing up in 6 of 12 eyes which received MMC treatment. The intraocular pressure (IOP) measurements and in vivo confocal microscopy (IVCM, Heidelberg Retina Tomograph II/ Rostock Cornea Module) of the conjunctiva were performed before surgery. The IOP measurements were repeated twice a week for 4 weeks after surgery. Bleb evaluation with ultrasound biomicroscopy (UBM) and fluorescein staining of the conjunctiva were performed every week for 4 weeks after surgery. IVCM was repeated at 1 and 4 weeks postoperatively. Histological evaluation was also done with tissue block obtained at 4 weeks postoperatively. Surgical failure was defined as either less than 20% IOP reduction at 2 consecutive measurements or disappearance of filtration space in UBM images.

Results: Surgical failure in control eyes occurred in 4 of 5 eyes at 1 week and in all eyes by 4 weeks after surgery. One eye with MMC only failed at 3 weeks after surgery, but no eyes with MMC and HPF failed. The average size of conjunctival epithelial cells in the bleb area measured by IVCM before surgery was 141 ± 5.7 , 139 ± 5.8 , and 134 ± 5.8 μm² in control, MMC only, and MMC+HPF eyes, respectively. The size at 1 and 4 weeks after surgery was 212 ± 145.3 and 149 ± 6.3 for control eyes, 494 ± 27.4 and 501 ± 52.5 for MMC only eyes, and 265 ± 101 and 204 ± 91.9 for MMC+HPF eyes. The size of conjunctival epithelial cells became significantly larger postoperatively only in eyes with MMC only ($p < 0.001$). IVCM showed the defects of conjunctival epithelium, which corresponded to the area of positive fluorescein staining and of epithelial thinning and defects in histology, in all eyes with MMC only, but not in any other eyes. Density of subepithelial connective tissue after surgery was lower in MMC only eyes than in MMC+HPF eyes ($p < 0.05$).

Conclusion: HPF has a protective effect on the conjunctival damage in the bleb area in the filtration surgery with MMC in rabbits.

P639 POLYDIOXANONE MEMBRANE AS A MITOMYCIN DELIVERY SYSTEM AFTER TRABECULECTOMY IN AN EXPERIMENTAL RABBIT MODEL

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Purpose: Pharmacologic modulation of wound healing after glaucoma filtering surgery remains a major clinical challenge in ophthalmology. Polydioxanone is a bioerodible and biocompatible polymer used in human suture. The purpose of this study is to investigate effectiveness of polydioxanone (PDS) membrane as mitomycin delivery system after trabeculectomy in rabbits by evaluating bleb appearance, intraocular pressure, and histological appearance of the subconjunctival (sc) area.

Methods: Ten New Zealand White rabbits (20 eyes) were assigned into 4 groups as follows: group 1 trabeculectomy alone (n = 4 eyes); group 2 trabeculectomy with intraoperative mitomycin-C (MMC) (0.2 mg/mL, n = 6); group 3 trabeculectomy with PDS mitomycin (n = 6) and group 4 trabeculectomy with PDS alone (n = 4).

Clinical exam and ocular pressure were evaluated over 7 and 15 days. Histology was performed to evaluate and grade the amount of scarring and fibrosis in each group.

Results: Mean IOP was respectively at 7 and 15 days: 8-11 mmHg in group 1; 5-11 mmHg in group 2; 5-5 mmHg in group 3 and 8-11 mmHg in group 4. There was significant difference between intraocular pressure in group 3 and the other groups (p < 0.05). Clinically, blebs were only present at day 15 in group 3, without local inflammation and fibrosis of the sc area. Histologic analysis revealed that eyes which received PDS-mitomycin had significantly less postoperative scarring at the microscopic level at day 7 and 15.

Conclusions: Polydioxanone membrane seems to be a good drug delivery system because it is associated with improved trabeculectomy bleb survival in the rabbit model and lower IOP. PDS membrane with mitomycin may be a useful way for improving success by limiting scar tissue formation after trabeculectomy.

P640 POLYESTER VASCULAR GRAFTS IN DIFFERENT TYPES OF GLAUCOMA SURGERY – FIVE-YEAR RESULTS

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Background: Drainage tubes or devices that prevent scarring and adhesion in the filtration area are gaining more and more attention from glaucoma specialists. Purpose of this study was to evaluate the efficacy of penetrating or non-penetrating glaucoma surgery in combination with the drainage device made from Hemashield Gold™ (Maquet GmbH, USA) or Albograft (LeMaitre Vascular Inc, USA), which are polyester collagen impregnated grafts used in vascular surgery.

Methods: This study involved 97 eyes of 84 patients with therapy-resistant glaucoma in advanced stages. The major types of glaucoma were primary open-angle glaucoma (POAG) – 77 eyes, phakolytic glaucoma – 15 eyes, diabetes-associated neovascular glaucoma – 5 eyes. All patients were divided into 2 groups by the type of operation: group A – sinistrabeculectomy with basal iridectomy (81 eyes), group B – deep sclerectomy (16 eyes). 'Hemashield Gold' was implanted under the scleral flap in 67 eyes in group A and in 13 eyes in group B. 'Albograft' was implanted in 14 eyes in group A and in 3 eyes in group B. Group B included patients with OAG only, Group A included the rest of the patients.

Surgery was performed according to the following steps: dissection of the conjunctiva 7-8 mm from the limbus and separation of scleral flap 6x6 mm, drainage fixation (size 1x3 mm) at 2 mm from the filtering zone, performing of sinistrabeculectomy 1x4 mm with basal iridectomy or deep sclerectomy, suturing of scleral flap to underlying sclera with 2 knots, suture on Tenon's capsule and conjunctiva.

Results: The follow-up period varied from 6 months to 5 years. Patients were followed at day 1, 3, 6, week 2, months 1, 3, 6 and 12 following surgery.

Surgery failed in 3 cases in patients with diabetes-associated neovascular glaucoma and in 5 cases of advanced glaucoma. The complete success rate, defined as an IOP lower than 21 mmHg without medications, was 91 % (87 eyes) at 6 months. At 1 year this rate was 85 % (81 eyes), because 6 patients after deep sclerectomy underwent Nd:YAG laser goniotomy. The other patients had no further changes in peripheral visual field, visual acuity remained as before the operation. Implant rejection was not observed in either patient.

Conclusions: Drainage devices made from Hemashield Gold™ and Albograft polyester vascular grafts demonstrate a pronounced and sustained effect in preventing adhesion of scleral flap in different types of therapy-resistant glaucoma in penetrating and non-penetrating glaucoma surgery.

P641 THE PREVENTION OF OCULAR SCARRING FOLLOWING GLAUCOMA FILTERING SURGERY USING THE PROTEIN SARATIN IN A RABBIT MODEL: A COMPARISON OF TWO DELIVERY TECHNIQUES

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Purpose: To compare two delivery routes for saratin (single intraoperative topical application vs. a combination of an intraoperative topical application with two additional postoperative injections) following glaucoma filtration surgery (GFS) in the rabbit model.

Methods: Twenty-four New Zealand White rabbits underwent GFS in the left eye and received intraoperative topical saratin, intraoperative topical saratin plus two additional injections on post-operative days 4 and 8, balanced saline solution (BSS), or mitomycin-C (MMC). The duration of bleb elevation as well as the bleb tissues were observed and compared based on clinical and histological findings.

Results: Rabbits receiving topical-injections of saratin had a mean bleb survival time of 33.6 ± 8.5 days, significantly higher than the negative BSS controls, which averaged 17.4

± 6.0 days ($p = 0.018$). No significant improvement over BSS was seen for rabbits receiving topical saratin only (15.5 ± 4.8 days, $p = 0.749$). Rabbits receiving saratin did not develop the bleb avascularity and thinning associated with MMC treatment. No apparent clinical signs of toxicity to saratin were seen.

Conclusions: A single intraoperative topical application combined with two additional postoperative injections delivered on post-operative days 4 and 8 were able to significantly prolong the duration of bleb elevation when compared to BSS controls.

P642 INJECTABLE CROSS-LINKED HYALURONIC ACID IMPLANT IN MITOMYCIN-C DEEP SCLERECTOMY

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Background: in September 2008, we started to use a new injectable cross-linked hyaluronic acid implant (HealafloTM) as a space-maintaining device for non-penetrating glaucoma surgery. The purpose of this study was to evaluate safety and efficacy of HealafloTM for mitomycin C (MMC) deep sclerectomy (DS) in open-angle glaucoma (OAG).

Methods: we reviewed all the HealafloTM MMC-DSs performed in our Center. The variables studied were IOP, BCVA, number of anti-glaucoma medications, need for Nd:YAG goniopuncture and possible complications. All procedures were performed by the same surgeon (PB) following a standardized surgical technique (independent of the implant): fornix-based conjunctival dissection, 5x5 mm square half-scleral-thickness outer flap, trapezoidal deep flap derroofing Schlemm's canal, 2-minute 0.3 mg/ml MMC application, cleavage of a 3-mm-wide descemet window leading to aqueous percolation (possible stripping of Schlemm's canal wall) and inner flap excision. When HealafloTM is used, the outer flap is sutured with 4 10-0 nylon stitches and the device is injected under the flap until it oozes from the margins, the limbal conjunctival wound is tightly sealed and the bleb is extensively filled with HealafloTM.

Results: 42 eyes of 37 patients (age $57.3 \pm 14.6^*$ years), were studied. Preoperative diagnoses included 27 primary OAG, 4 pseudoexfoliative, 4 pigmentary, 3 uveitic, 2 normal-tension and 2 other OAGs. There were no intraoperative complications except for 2 uneventful Descemet's membrane microperforations. The IOP dropped from a preoperative value of $26.3 \pm 7.4^*$ mmHg on $3.6 \pm 0.9^*$ medications to $11.2 \pm 3.0^*$ mmHg ($p = 0.0000$) at the end of the follow-up ($10.9 \pm 6.4^*$ months, range 1-27). Presently, to achieve target IOP, 1 eye needs 1 medication, one is on 2 drugs and 3 more required repeat filtering surgery at 3, 6 and 9 months and were therefore considered failures. Preoperative and final BCVAs were $0.73 \pm 0.32^*$ and $0.77 \pm 0.35^*$ (n.s.). At 12 months, absolute (unmedicated) and qualified (with or without medication) success rates (Kaplan-Meier analysis, IOP 6-21 mmHg inclusive) were 83% and 91%, whereas absolute 'low-teen' success rate (IOP 6-16 mmHg inclusive) was 80%. As for postoperative adverse events, 1 eye had a transient IOP rise due to blood under the flap, 1 required a compression suture of a high nasal bleb causing a dellen at 1 month, 1 eye showed a partial iris apposition to an intact descemet window and was started on a monotherapy on month 11 and 2 eyes needed 5-fluoruracil injections. One eye developed a

cataract and underwent phacoemulsification at 10 months. Twenty eyes underwent Nd:YAG goniopuncture (after $4.4 \pm 5.2^*$ months) following which one had a choroidal detachment (spontaneously healed in 1 month) and 5 eyes developed an iris plug at the puncture site: four were resolved by iris repositioning, Nd:YAG iridotomy and laser iridoplasty, whereas one required a surgical iridectomy. *(Mean \pm SD).

Conclusions: injectable cross-linked hyaluronic acid implant (HealafloTM) is safe and effective for MMC deep sclerectomy in open-angle glaucoma. Approximately half of our cases required Nd:YAG goniopuncture over time, and such procedure was sometimes followed by complications: to avoid them, we now perform laser iridotomy and localized iridoplasty before carefully puncturing Descemet's membrane.

P643 OUTCOMES OF NON-PENETRATING DEEP SCLERECTOMY SUPPLEMENTED WITH MMC AND NO SCLERAL IMPLANT. THREE-YEAR FOLLOW-UP

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Background: Non-penetrating deep sclerectomy (NPDS) with scleral implant is a well-known, successful procedure. On the other hand, NPDS without scleral implant remains to be a controversial topic. In this series, we evaluate the ocular hypotensive efficacy, the visual acuity and anterior segment morphological changes after NPDS supplemented with mitomycin C (MMC) and no scleral implant.

Materials: This is a retrospective study of 73 open-angle glaucomatous eyes of 73 consecutive patients who underwent NPDS supplemented with MMC for intraocular pressure (IOP) control. IOP, visual acuity and the number of IOP lowering drugs used were evaluated at 1 month, 3 months, and 1, 2 and 3 years after surgery. Patients were assessed for the presence of a subconjunctival filtering bleb, the volume of an intrascleral cavity, and a suprachoroidal hypoechoic area. These morphological changes in the anterior segment were examined using ultrasound biomicroscopy (UBM). For the statistical analysis, the ANOVA test was used.

Results: Preoperative mean IOP was 19.37 ± 4.9 mmHg, the number of meds used was 2.18 ± 4.92 and the best corrected visual acuity (BCVA) was 0.76 ± 0.29 . Three months after surgery, the mean IOP was 13.32 ± 3.40 mmHg, the number of meds used was 0.1 ± 0.4 , and the BCVA was 0.68 ± 0.2 . At the third year, the mean IOP was 13.84 ± 3.81 mmHg, the number of meds was 0.5 ± 0.8 , and the BCVA was 0.60 ± 0.04 . No statistically significant differences were found in the IOP and in the BCVA between the third month and the third year follow-up visits. In 34 eyes (46.5%), a YAG goniopuncture had to be performed. In most of patients, the presence of a subconjunctival filtering bleb, an intrascleral cavity, and a suprachoroidal hypoechoic area was observed in the long term.

Conclusion: NPDS supplemented with MMC and no scleral implant seems to be successful in both IOP reduction and BCVA preservation in the long term follow up.

P644 TRABECULECTOMY USING BIODEGRADABLE COLLAGEN MATRIX IMPLANT IN CHRONIC PRIMARY GLAUCOMA PATIENTS

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Purpose: To evaluate the outcomes of trabeculectomy using biodegradable collagen matrix (BCM) implant in chronic primary glaucoma patients

Methods: A prospective interventional preliminary study was conducted. Trabeculectomy using BCM implants were done in 10 eyes. Intraocular measurements as well as bleb morphology grading using photography and the Moorfields Bleb Grading System were done on day 7, 14, 28 and 56 post-operatively. Bleb analysis using anterior segment optical coherence tomography (AS-OCT) were done on day 28 and 56 post operatively. Possible complications were to be evaluated.

Results: Ten patients were followed up for 2 months: 80% were classified as successful. 10% failure. 10% excluded due to incomplete follow up. Mean IOP was 15.8 mmHg, with mean reduced IOP of 14.2 mmHg. Majority of successful bleb showed high subconjunctival cavity with micro-hyporeflexive spaces in the bleb wall. The bleb height obtained by photography was not in full agreement with the height obtained by AS-OCT. No complications were found in all patients at all times.

Conclusions: Trabeculectomy with BCM implant showed a tendency to maintain a good IOP with the presence of characteristics found in functioning blebs characteristics for up to 2 months post operative.

P645 ENHANCING SUCCESS RATES OF GLAUCOMA DRAINAGE DEVICES WITH ANTIPROLIFERATIVE COATINGS

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Background: Episcleral glaucoma drainage devices (GDD) are a surgical option for the treatment of refractory glaucoma. Their long term success is often limited by fibrous encapsulation of the base plates of the devices. In previous work we were able to show, that the surface topography of the base-plate has a significant impact on Tenon's fibroblast adhesion. It may thus influence wound healing and the development of the dense fibrous capsules that limits aqueous humor resorption in failed GDD surgery. The aim of this study was to evaluate different methods of surface modification and their effect on Tenon's fibroblast adhesion and proliferation.

Methods: Standard culture dishes were coated with different thin film polymers in a chemical vapor deposition process. Cell adhesion and cell morphology were evaluated. In a separate series of experiments standard culture dishes as well as test bodies consisting of a clear silicone were coated with a modified responsive hydrogel, that can swell to 5-10 fold of its dry volume below its lower critical solution temperature (LCST) of 34°C and collapses above this LCST. We tested cell adhesion, as well its capacity for taking up and releasing paclitaxel, a compound known to inhibit Tenon's fibroblast proliferation, migration and collagen production.

Cytotoxicity of the hydrogel was assessed using flow cytometric determination of the rates of apoptosis and necrosis of primary human Tenon's fibroblasts exposed to the hydrogel for different periods of time. The effect of loading the hydrogel with different concentrations of paclitaxel on fibroblast proliferation was measured using Alamar Blue, a single-step non-toxic fluorimetric viability assay.

Results: Out of several plasma polymers, ppEO2 – a PEG-like polymer, was shown to be anti-adhesive for primary Tenon's fibroblasts. In a patterning experiment, cells were able to attach to untreated portions of the substrate, while the coated parts remained void of cells. The modified hydrogel proved to be anti-adhesive to the fibroblasts both above and below its LCST. Cells exposed to the hydrogel alone for 24 hours and then re-seeded in an uncoated culture dish showed no inhibition of attachment or proliferation, indicating low toxicity at short term exposure. This was confirmed by an unaltered rate of apoptosis and necrosis after 24 hours. Longer term exposure however lead to an increased rate of apoptosis, presumably because of the inability of the cells to attach to any surface. Paclitaxel-loaded hydrogel lead to a dose dependent inhibition of cell proliferation after re-seeding. The rates of apoptosis and necrosis were increased accordingly and further increased with exposure time.

Conclusions: Both plasma polymers as well as a novel hydrogel were able to prevent Tenon's fibroblast attachment, and may therefore be useful for simple and cost-effective surface modification of commercially available Glaucoma Drainage Devices. The hydrogel used in our experiments may further be a viable reservoir for the long term release of low doses of antifibrotic substances. Optimization of the surface properties of GDD may potentially lead to lower rates of fibrous encapsulation and thus increase clinical success rates.

P646 THE EFFECTS OF TOPICAL BEVACIZUMAB APPLICATION ON THE EARLY BLEB FAILURE AFTER TRABECULECTOMY

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Aim: To evaluate the influence of topical bevacizumab application upon a formation and function of filtering blebs after various types of anti-glaucoma surgery (MMC augmented trabeculectomy or miniExpress implantation) in early bleb failure.

Materials and Methods: 8 patients (9 eyes) with glaucoma (OAG, NTG, OAG in pseudoexfoliative syndrome) after MMC augmented trabeculectomy and 1 patient (1 eye) after mini-Express implantation with injected bleb 1 week after surgery were analyzed. All patients were treated with standard steroid therapy and topical bevacizumab (5 mg/ml) 5 times a day for 2 weeks. Blebs were evaluated for vascularity in a slit lamp by the same surgeon with concomitant photographic documentation and IOP measurements.

Results: All the patients were followed for 6 months. Elevated, functional bleb with significantly reduced vascularity was present in 7 eyes, while in 2 it was flat and non-functional. The average IOP decreased from 30.78 ± 10.49 before surgery to 16.11 ± 7.74 6 months after surgery ($p = 0.004$). 4 eyes (44.4%) achieved success, defined as IOP ≤ 18 mmHg with a good bleb morphology. 3 eyes (44.4%) achieved qual-

ified success, defined as a good bleb morphology with IOP > 18 mmHg without anti-glaucoma medications (with average decrease of IOP over 44%); 2 eyes (25%) were classified as failures with IOP > 18 mmHg and unsatisfactory bleb morphology.

Conclusions: Topical application of bevacizumab in parallel with a routine treatment might favor a functional bleb formation after trabeculectomy with a high risk of failure.

P647 EFFECTS OF A NEW SUBCONJUNCTIVAL BEVACIZUMAB-DELIVERY SYSTEM ON EXPERIMENTAL GLAUCOMA FILTRATION SURGERY

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Background: Vascular endothelial growth factor (VEGF) has been suggested to be involved in the scarring process due to the proliferation of fibroblasts. The polyurethanes have been extensively investigated for biomedical applications, as scaffold for tissue regeneration and as controlled/sustained release drug delivery systems, because of their excellent biocompatibility, chemical versatility and mechanical properties. The aim of this study was to evaluate the effect of the bevacizumab-loaded polyurethane implant (BPUI) as a new drug delivery system in a rabbit model of glaucoma filtration surgery.

Methods: Polyurethane was obtained in aqueous dispersion through the conventional process. Bevacizumab (1.5 mg) was incorporated into the dispersion with subsequent drying to form the polymeric film. Films of 3 x 3x 1 mm containing (group 1, n = 5) or not bevacizumab (group 2, n = 5) were placed in the subconjunctival space, at the surgical site. The *in vitro* release of bevacizumab was evaluated with high-performance liquid chromatography (HPLC) and its *in vivo* effects was investigated in an experimental model of trabeculectomy by measuring the intraocular pressure (IOP, with Tonopen), bleb area (using Moorfields bleb grading system) and collagen deposition (image J measurements of sirius red staining), and by immunohistological analysis of VEGF.

Results: HPLC showed that 100% of bevacizumab was released until day 5. *In vivo* studies demonstrated no adverse effect, however no significant difference was observed in terms of IOP reduction (2.7 vs 2.2 mmHg), bleb area scores (2.6 vs 2.0) and collagen deposition intensity proportion (0.23 vs 0.20) between group 1 and 2 respectively, at day 5. BPUI was associated with a significant lower proportion of VEGF-expressing fibroblasts (0.17 vs 0.35 cells/field, p = 0.005; Mann Whitney U test).

Conclusions: This study demonstrated that the BPUIs allowed a short-term release of bevacizumab *in vitro*, were well tolerated in rabbits' eyes and promoted a reduction of VEGF-expressing fibroblasts. Further pharmacokinetic studies with BPUI will be necessary to improve our results in terms of optimizing its bio-availability with minimal side effects.

P648 STUDY OF THE SAFETY AND EFFECTIVENESS BETWEEN OLOGEN™ COLLAGEN MATRIX IMPLANT AND MITOMYCIN-C IN STANDARD GLAUCOMA FILTRATION SURGERY

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Background: To evaluate the efficacy and safety of collagen matrix implant in trabeculectomy comparing with patients undergoing trabeculectomy with Mitomycin-C.

Methods: In this non-randomized, parallel clinical trial 22 eyes were categorized into two groups, each comprising 11 eyes. Group A comprised patients that received trabeculectomy with Collagen Matrix implant (Ologen™).

Results: Mean pre-operative IOP was 35.33 mmHg (21–55 mmHg) in Group A versus 34.6 mmHg (21–45 mmHg) in Group B. On day 30th the mean IOP in Group A was 11.5 mmHg (5–30 mmHg) vs. 13.37 mmHg (2–40 mmHg) in Group B.

Conclusion: Implantation of Collagen Matrix implant (Ologen™) effectively brings IOP under control through the formation of a loosely structured filtering bleb. This device may represent a safe, simple and effective therapeutic approach for treating refractory glaucoma without determined complications seen using adjunctive therapy.

Surgical Treatment: Congenital Glaucoma

P649 INITIAL RESULTS OF GONIOTOMY IN PRIMARY CONGENITAL GLAUCOMA IN VIETNAMESE EYES

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Background: In Western countries, goniotomy is considered as a first line surgery for primary congenital glaucoma (PCG) due to its high effectiveness and safety. In Vietnam and some Asian countries, goniotomy was never done. The aim of this study is to evaluate the initial outcomes of goniotomy for PCG in Vietnamese eyes.

Methods: This was a pilot study on 10 eyes with PCG in Ho Chi Minh City Eye Hospital. The patients underwent goniotomy between August, 2009 and April, 2010 by a single surgeon with follow-up of 3 – 9 months. Surgical success was assessed based on postoperative intraocular pressure (IOP) appropriate for central corneal thickness (CCT) without additional medications or surgeries, with decreased corneal edema, stabilized corneal diameter and refraction, and no optic nerve progression during follow-up.

Results: 10 eyes were grouped into newborn PCG (2), infantile PCG (3) and late-recognized PCG (5). Overall surgical success was achieved in 7 eyes (70%), including 100 % for newborn and infantile PCG, and 40 % for late-recognized PCG. The correlation between surgical success and preoperative corneal diameter was not found. Mild hyphema occurred in 2 eyes (20 %) and was transient.

Conclusion: Although follow-up time is short in this series,

the safety and effectiveness of goniotomy has brought a new perspective to choosing it as a primary surgical procedure for PCG in Vietnam and other Asian countries.

P650 CONGENITAL GLAUCOMA. GONIOTOMY PRACTICE

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Background: Congenital glaucoma is a hundred percent surgical condition by their nature, and medical treatment is only a prelude to surgery, which eye if conditions are right the original is the goniotomy. Is presented and proposed the 20-year experience with surgical technique goniotomy we believe is easy to implement and cheaper for the material used. Goniotomy is a surgical technique that requires a good training under the instruction of an experienced teacher of glaucoma in the same, the ophthalmologist must be skillful in handling the microscope and be familiar with the Koeppe, Barkan, Worst lens or your preference to visualize the anterior chamber angle, an area in which to conduct the surgical procedure.

Material and Methods: It was a retrospective review of records of the Hospital Ophthalmology Department of Pediatrics, National Medical Center Siglo XXI Instituto Mexicano del Seguro Social, for the last 10 years in patients with congenital glaucoma and juvenile, subject to goniotomy. The technique for goniotomy, is to use a hypodermic needle gauge 25 or 26 mounted on a 10 cc syringe filled with balanced salt solution that prevents any loss of the anterior chamber because the pressure balanced salt solution on the pressure anterior chamber, and in case of narrowing or loss of anterior chamber formed and continues the same surgery, the instrument (needle size 25-26) used is cheap, used one for surgery and its cost is minimal Another advantage is the mobility that enables single fingers pivot between the body of the syringe and we can easily make the goniotomy both left and right and we can achieve a cut of up to 110°, the fineness of the needle allows easy corneal sealing the puncture after air-filled anterior chamber.

Results: We reviewed the files of 130 primary congenital glaucoma and 70 glaucoma associated with congenital abnormalities (Sturge-Weber and Rieger). In 130 primary congenital glaucoma 64% showed good intraocular pressure control with a goniotomy. The rest of the patients required more than one goniotomy or filtering surgery.

Conclusions: Congenital glaucoma is 100% surgical. Clear cornea before the first surgical choice is goniotomy. Goniotomy needle is quick, easy and economical.

P651 OUTCOME OF COMBINED TRABECULOTOMY WITH TRABECULECTOMY WITH MITOMYCIN-C IN PRIMARY DEVELOPMENTAL GLAUCOMA

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Background: To review the outcome of combined trabeculotomy with trabeculectomy with Mitomycin- C (MMC) in

patients with primary developmental glaucoma. Retrospective, non comparative, nonrandomized case series. Ninety eyes of 51 patients operated at Shroff's Charity Eye Hospital, New Delhi from Feb 2004 to March 2010 were included in the study.

Methods: The medical records of the operated patients with a minimum follow-up of 6 months were reviewed for demographic data, age of presentation, time of diagnosis of the disease, visual acuity, intraocular pressure (IOP), corneal diameter and clarity. Record of postoperative corneal diameter and clarity, anterior chamber depth, IOP, and complications were noted. The main outcome measures were preoperative and postoperative IOP, corneal clarity, refractive errors, intra operative and postoperative complications.

Results: 90 eyes of 51 patients were included with 33 (64.7%) males & 18 (35.3%) females. The affliction was bilateral in 39 eyes (76.4%) while unilateral involvement was seen in 12 eyes (23.5%). The age of presentation ranged from 3 days – 13 yrs. Fourteen patients (27.5%) presented at ≤ 6 months of age while 37 (72.5%) patients presented after 6 months of age. The mean preoperative IOP was 32.9 mmHg ± 9.8 mmHg (Range = 15-54 mmHg). Postoperatively mean IOP observed was 18.1 ± 6.1 mmHg (Range = 5-32 mmHg). Percentage reduction in IOP was 44.9% (p < 0.05). Out of 90 eyes, 18 eyes (20%) had clear cornea at presentation, whereas corneal edema with or without Haab's striae or scarring was present in 72 eyes (80%). Postoperatively, clear cornea was seen in 53 eyes (58.9%) while central corneal scarring was present in 37 eyes (41.1%). Mean horizontal corneal diameter at presentation was 13.29 ± 0.9 mm (Range 10-15 mm). None of the patients showed an increase in corneal diameter after successful intervention. Preoperatively assessment of visual acuity was not possible in most of the cases due to presence of extensive corneal edema. Post operatively best corrected visual acuity could be recorded in 45 eyes (50%). Retinoscopy in 48 eyes revealed myopia with or without astigmatism in 38 eyes (79.2%) and hyperopia with or without astigmatism in 10 eyes (20.8%). Post operative complications were seen in 9 eyes (10%) which mainly comprised of shallowing of anterior chamber. In 3 eyes surgical intervention in the form of chamber reformation was required, rest 6 eyes showed spontaneous reformation with conservative management. The achievement of 'complete success' defined as IOP of < 21 mmHg without any medication and clinically stable glaucoma at last follow up was in 75 eyes (83.3%) while a 'qualified success' of having IOP < 21 mmHg with one medication was achieved in 7 eyes (7.8%). Eight eyes (8.9%) met failure where IOP of 21 mmHg could not be achieved after surgery and re-surgery was planned.

Conclusion: Combined trabeculotomy-trabeculectomy is potentially a very successful procedure in patients with primary developmental glaucoma.

P652 OUTCOMES OF AHMED VALVE IMPLANTATION FOR REFRACTORY PEDIATRIC GLAUCOMA

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Background: We evaluated the efficacy and safety of Ahmed Glaucoma Valve (AGV) implantation in children with glaucoma.

Methods: The medical records of pediatric patients with pri-

mary or secondary refractory glaucoma who underwent AGV implantation with a minimum follow-up of 6 months were reviewed. Success was defined as a reduction of the intraocular pressure (IOP) to 21 mmHg or lower with or without medications in the last follow-up visit, no additional glaucoma surgery, and no significant complications.

Results: A total of 20 eyes of 20 patients were included in the study. Twelve patients had primary congenital glaucoma and 8 patients had secondary glaucoma. The S2 AGV model was used in 15 patients, and S3 AGV model was used in 5 patients. The mean (SD) age of the patients was 9.7 (4.1) years. The mean number of glaucoma surgeries before AGV implantation was 2.4 (range, 1-4). The mean(SD) preoperative IOP was 26.1 (5.7) mmHg, and the mean (SD) postoperative IOP was 17.3 (4.5) mmHg. The mean (SD) change in IOP was 8.8 (7.1) mmHg ($p < 0.001$). The overall success rate (IOP < 21 mmHg) was 80% (16 patients). The mean number of medications decreased from 2.7 (range, 1-4) to 2.1 (range, 0-4). One child had ocular hypotony on the first postoperative day. No other significant surgical complications were observed.

Conclusion: The AGV implant seems to be effective and safe in the management of refractory glaucoma in pediatric patients.

P653 AUDIT OF OUTCOME OF TRABECULECTOMY BLEB NEEDLING IN PAEDIATRIC PATIENTS

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Background: Pediatric glaucoma causes significant visual disability and can prove more challenging to manage than glaucoma in adults. Brisk healing and fibrosis of the bleb site means that most children undergoing trabeculectomy or trabeculectomy-trabeculotomy require further bleb revision or 'needling' with or without concurrent use of antimetabolite. This audit aims to assess the outcome of bleb revision by needling procedures in pediatric glaucoma at a quaternary referral center in England.

Method: This was a retrospective audit, conducted from March 2005 – March 2010. Patients were identified via the Manchester Royal Eye Hospital theatre coding system, their medical records obtained and analyzed. Data was collected for up to 2 years post initial needling. Criteria to be audited were identified by the primary and senior authors.

Results: Twenty-one pediatric patients, (30 eyes) underwent trabeculectomy bleb needlings. There were 15 male and 6 female patients who ranged in age from 7 days – 7 years. Forty-three percent of patients were Caucasian, 1/3 were Asian, and the remainder were Afro Caribbean or Middle Eastern. One hundred thirty-nine bleb needlings were performed and data was collected on 93 episodes (maximum of 5 needlings per eye analyzed). Over 60% of these patients had congenital glaucoma, with nearly 20% having anterior segment dysgenesis. Two bleb needlings were required most commonly (8 out of 30 eyes) and the majority of children needed 5 or fewer bleb needlings (20 out of 30 eyes). In 24 out of 30 eyes, the intraocular pressure decreased or was less than or equal to 15 at final review. Where documented (23 cases out of 30) 16 eyes exhibited a stable or decreased cup-to-disc (C:D) ratio over time, with 7 demonstrating an increased C:D ratio. Seven patients required additional pres-

sure-controlling procedures, and of these, 6 had a minimum of 7 bleb needlings, and 6 were Asian or Afro Caribbean. Five patients (7 eyes) eventually needed topical hypotensives. There was a low immediate postoperative complication rate, 7 patients in total and no cases of bleb related infection.

Recommendations: There was variation in the volume of 5FU used (maximum 7.5 units), the number of bleb sites needled and the post-operative steroid regime utilized. A purpose designed operative pro-forma has since been created for implementation by the senior clinicians involved in this treatment.

Conclusions: Pediatric glaucoma requires intensive management and bleb needling following trabeculectomy-trabeculotomy is inevitable. Assessing success is less definable than in the adult population as visual fields are usually not possible and visual acuity testing methods are numerous. These results show that bleb needling allows a stable and satisfactory IOP to be maintained for up to 2 years post-initial glaucoma surgery. Often more than one bleb needling is required. There was a low incidence of post-operative complications, with no bleb related infection encountered. A minority of patients require additional procedures, usually those with risk factors for intractable glaucoma. Where documented, 2/3 of patients exhibit an improved or stable cup to disc ratio over time and bleb morphology tends to improve over time.

Surgical Treatment: Angle Surgery

P654 SURGICAL TECHNIQUE AND RESULTS OF LENS-INDUCED CLOSED-ANGLE GLAUCOMA WITH ORGANIC ANGULAR BLOCK TREATMENT

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Background: Block of outflow pathways resulting from pathological mechanisms associated with lens and zonulae status may provoke both acute and chronic closed-angle glaucoma. In this paper we present some specific surgical details and results of surgery in closed-angle glaucoma with lens-induced component of angle closure.

Methods: A retrospective analysis of operations in 46 eyes of 40 patients with lens-induced closed-angle glaucoma has been performed. Age of the patients ranged from 31 to 89 years; there were 16 males and 24 females. Mean IOP before surgery was 42 ± 4 mmHg (range, 27 to 77 mmHg). Thirty-two patients (80%) were on hypotensive drops. Before surgery laser iridotomy has been performed in 8 eyes, filtering surgery in 12 eyes. Visual acuity before surgery ranged from light perception to 0.9 (mean, 0.26 ± 0.2). Phacomorphic glaucoma has been diagnosed in 26 eyes, phacotopic in 20 eyes. Surgical technique included deepening of the anterior chamber by evacuation of a portion of the vitreous via pars plana. Then the lens was exchanged for IOL, goniosynechiolysis was performed. In cases with zonular lesions phacemulsification was performed accurately, intracapsular rings were used. In absence of zonular support phacofragmentation via self-sealing incision was performed; IOL was fixed to the iris or to the sclera.

Results: Early post-op complications included Descemet

folds in 9 cases (20%), exudate in 8 (17%), hyphema in 3 (6%), early hypertension in 6 (13%). In remote period IOP elevation was seen in 6 cases (13%). Mean IOP by 14 months after surgery was 18.6 ± 2.7 mmHg; mean visual acuity was 0.5 ± 0.15 . Visual fields were stable in 42 cases (91%).

Conclusions: Presented technique of lens-induced closed-angle glaucoma treatment has a pathogenetic background and provides high efficacy (87% without medications) which is explained by eradication of basic mechanisms causing IOP elevation in this group of patients.

P655 LONG-TERM RESULTS OF A NOVEL MINIMALLY INVASIVE, DEEP SCLEROTOMY AB INTERNO SURGICAL PROCEDURE FOR GLAUCOMA

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Purpose: To demonstrate the efficacy and safety of a new surgical procedure termed sclerothermalotomy ab interno (STT ab interno) for treatment of primary open-angle glaucoma and juvenile glaucoma.

Patients and Methods: STT ab interno procedures were performed in 58 eyes of 58 consecutive patients, 53 with open-angle glaucoma and 5 with juvenile glaucoma between February 2002 and July 2002. STT ab interno was performed with a custom made high-frequency dissection 19G probe (tip 0.3x1 mm) applying bipolar current with a frequency of 500 kHz. Probe was used to penetrate 1 mm into the nasal sclera ab interno, through the trabecular meshwork and Schlemm's canal, forming a deep sclerotomy or 'thalamus' of 0.3 mm high and 0.6 mm wide.

Results: Average preoperative intraocular pressure (IOP) was 25.6 ± 2.3 mmHg (range 18 to 48 mmHg) for open-angle glaucoma and 39.6 ± 2.3 mmHg (range 34 to 46 mmHg) for juvenile glaucoma. All patients had a minimum follow-up of 72 months. Mean IOP was 14.7 ± 1.8 mmHg for open-angle glaucoma and 13.2 ± 1.3 mmHg for juvenile glaucoma at 72 months. Postoperative IOP was significantly lower than the preoperative IOP at all measured intervals ($p < 0.001$). After 72 months, 11 eyes (20.8%) were on IOP-lowering medications. There were no serious complications related to procedure.

Conclusions: Sclerothermalotomy ab interno is a minimally invasive, safe and efficacious surgical technique for lowering IOP in open-angle glaucoma and juvenile glaucoma.

P656 TRABECULAR MICRO-BYPASS STENT (ISTENT). INITIAL RESULTS

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Background: The iStent (Glaukos Corporation, Laguna Hills, CA) was developed to facilitate physiologic outflow and reduce intraocular pressure (IOP) in patients with open-angle glaucoma by creating a patent bypass in the trabecular meshwork. The purpose of this work was to perform an initial evaluation of the iStent in cases with primary open-angle

glaucoma (POAG), pseudoexfoliation glaucoma (PXF), mixed mechanism glaucoma, angle recession glaucoma and normal-tension glaucoma (NTG).

Methods: During the period January to August 2010, 28 iStents were implanted in the Manchester Royal Eye Hospital. In this prospective case series, 26 of the 28 eyes underwent phacoemulsification in combination with iStent implantation. 18 eyes had POAG, 4 had PXF, 2 had mixed mechanism glaucoma, 2 had angle recession glaucoma and one had NTG. Evaluations included IOP, ocular hypotensive medications, cup-disc (CD) ratio, visual field and postoperative surgeries.

Results: To date, all eyes have been followed for a minimum of 3 months with an average of 4.3 months. Preoperatively, the mean age was 77.9 years (range: 56 to 98 years). Mean CD ratio was 0.68. Mean visual field (mean deviation; MD) was -10.78 dB, mean visual field (pattern standard deviation; PSD) was 5.69 dB. IOP was 22.7 mmHg (range: 16 to 40 mmHg). Patients were taking an average of 2.4 (range 1 to 5) ocular hypotensive medications. Six patients presented with pre-existing pathologies (e.g., ARMD). Prior surgeries included SLT/ALT ($n = 7$), diode laser ($n = 1$) and cryo buckle ($n = 1$). At the most recent postoperative follow-up, mean IOP of 15.8 mmHg was significantly lower than pre-op IOP ($p < 0.001$). Postoperative reduction to 0.5 medications was significant ($p < 0.01$). 57% of patients achieved IOP ≤ 18 mmHg with no ocular hypotensive medications, while 78% of patients achieved IOP ≤ 18 mmHg with medications. 68% of patients were off all topical treatments at last follow up. One patient failed and required diode laser. No significant complication occurred.

Conclusions: From these initial findings, iStent appears to be a safe and effective treatment for glaucoma. It significantly reduces IOP and the number of glaucoma medications. It requires minimal post-operative care and is especially suitable for glaucoma patients with coexisting cataracts. A larger series with a minimum of 6 months follow up will be presented at the meeting.

P657 A PILOT STUDY OF TRABECTOME IN KITASATO UNIVERSITY HOSPITAL

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Background: To describe clinical results from a pilot study of Trabectome, which has been cleared for clinical use by Japanese Ministry of Health, Labour and Welfare in September 2010 and has been introduced to Kitasato University Hospital in December 2010.

Subjects and Methods: Ten eyes of 9 Japanese patients with uncontrolled open-angle glaucoma (OAG) with maximum tolerable anti-glaucoma medications were enrolled in this study. Trabectulotomy ab interno was performed with the Trabectome (NeoMedix Corp., San Juan Capistrano, CA) by one surgeon (NS). Intraocular pressure with Goldmann applanation tonometer and visual acuity were measured before and after surgery. Intraoperative and early postoperative adverse events were also evaluated.

Results: Preoperative pressures was 36.9 ± 1.7 mmHg with medications. Mean postoperative IOPs were 18.7 ± 16.2 mmHg ($n = 10$) at 1 day, 18.6 ± 11.6 mmHg ($n = 10$) at 3 days, 20.4 ± 9.7 mmHg ($n = 10$) at 1 week, 23.7 ± 11.6 mmHg

(n = 7) at 2 weeks, and 16.3 ± 2.5 mmHg (n = 4) with topical medications at 1 month. Visual acuity remained stable in all patients 1 week after surgery. Blood reflux occurred in all eyes intraoperatively and decreased in several days in almost cases.

Conclusions: In this short-term evaluation of a pilot study in Japanese patients, Trabectome seems to be a safe and effective method of lowering IOP in OAG. A long-term follow-up should be needed.

P658 NPDS WITH SPURECTOMY AND SUPRACILIAR IMPLANT

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Background: To determine the safety and efficacy of the non-penetrant deep sclerectomy (NPDS) with spurectomy and supraciliary Esnoper implant placement to facilitate aqueous humor outflow by suprachoroidal way.

Methods: Retrospective observational descriptive study with 90 eyes of 78 patients that were performed non-penetrating filtration surgery for glaucoma with spurectomy. The new technique consisted of a non-penetrating deep sclerectomy as the standard technique coupled with the spurectomy and supraciliary Esnoper implant (Fig. 1).

Results: The mean preoperative Intraocular pressure (IOP) was 27.97 mmHg, the postoperative IOP at one year of follow up was 16.28 mmHg, with a decrease in IOP of 44.76% (12.52 mmHg). Complete success was found in 50.6%, the relative success was 39.1% and 10.3% of failures. The mean number of glaucoma medications was of 3.28 and a year after surgery just 31 patients required treatment, with an average of 1.21. About complications we found 11.1% cases with hyphema, 3.33% of seidel, choroidal detachment in 1.1% and 4.4% with interlocking of the iris.

Conclusions: This technique offers the suprachoroidal route like an alternative drainage for the intrascleral of the conventional process (Fig. 2), thereby enhancing the way out of the aqueous humor, with the benefit of no penetration into the anterior chamber of the regular surgery.

P659 THE EFFECT OF MODIFIED SUTURE TRABECULOTOMY FOR UVEITIC GLAUCOMA

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Background: We developed the modified 360-degree suture trabeculotomy, and reported the surgical techniques at WGC 2009 (Boston). A standard trabeculotomy with metal trabeculotomes largely fails to control uveitic glaucoma, but our modified suture trabeculotomy was effective for several cases of open angle uveitic glaucoma in the previous study. In this study, we report the effect of modified suture trabeculotomy for the large number of uveitic glaucoma patients including both secondary open-angle glaucoma (SOAG) and secondary angle-closure glaucoma (SACG).

Methods: The operation procedure of modified 360-degree suture trabeculotomy was as follows. We made double sclera flap to easily identify Schlemm's canal. The sodium hyaluro-

nate was injected into the canal and anterior chamber, then the 5-0 nylon suture with a matchstick-like end was applied to cannulate Schlemm's canal. After the cannulation of entire circumference of Schlemm's canal, a sharp 30-gauge needle was used to pierce a hole in the anterior chamber through the inner wall of Schlemm's canal at each corner of the sclera flap. The suture was then inserted through the hole at the same corner and retrieved using capsulorhexis forceps, which were inserted through the corneal side port incision made at the opposite side of the scleral flap. Finally, the scleral flap was closed using 10-0 nylon sutures, and the sodium hyaluronate was removed from the anterior chamber using aspiration and irrigation handpieces. From September 2007 to May 2010, modified suture trabeculotomy was performed to 41 eyes (36 adult patients) with uveitic glaucoma. The causes of uveitis were sarcoidosis (17 eyes), Vogt-Koyanagi-Harada disease (5), Behcet's disease (3), Posner-Schlossman syndrome (2), and unknown (14). Thirty eyes were SOAG, and 11 eyes were SACG. The mean preoperative IOP was 34.6 mmHg, and the mean number of anti-glaucoma medications was 3.0. The mean postoperative follow up period was 24 months.

Results: The mean postoperative IOP was 12.7 mmHg, and the mean number of anti-glaucoma medications was 0.5 at 12 months after surgery. The surgery did not induce remarkable exacerbation of uveitis. When the 5-0 nylon suture incised the trabecular meshwork, the peripheral anterior synechia could be also released by the 5-0 nylon suture in the cases of SACG.

Conclusions: Modified suture trabeculotomy could effectively reduce the IOP in both open angle and angle closure uveitic glaucoma. We consider that this surgical technique provided good results by the wide range and precise incisions of Schlemm's canal using the 5-0 nylon suture.

P660 USE OF INTRA-OPERATIVE GONIOSCOPY FOR SUCCESSFUL DIRECT CYCLOPEXY FOR TRAUMATIC CYCLODIALYSIS CLEFT

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Background: Cyclodialysis clefts are rare and are most commonly secondary to blunt ocular trauma. Various techniques can be employed to achieve cleft closure. However treatment is difficult and can often lead to permanent visual loss. Surgical repair by direct cyclopexy is a well documented technique. To document a case of a young gentleman with a cyclodialysis cleft secondary to blunt trauma, resulting in hand movements visual acuity due to ocular hypotony, suprachoroidal effusion, retinochoroidal folds and optic disc swelling. A video will show identification of the cleft with intra-operative gonioscopy after use of intracameral viscoelastic, and direct cyclopexy for closure of the cleft. It will highlight the advantage of using gonioscopy during surgery for effective and complete closure of the cleft.

Methods: A patient presented to the clinic with a sudden loss of vision a few weeks after blunt trauma to the eye. Examination revealed HM visual acuity, intra-ocular pressure of 0 mmHg, suprachoroidal effusion with choroidal folds and optic disc swelling. After informed consent, the patient was admitted and underwent direct cyclopexy under general anaesthesia. After obtaining informed consent, the procedure was

recorded and the video edited to present with the purpose of continuing education of ophthalmologists and trainees alike.

Results: DVD presentation of diagnosis and direct Cyclohexy for successful management of cyclodialysis cleft secondary to blunt ocular trauma, illustrating the advantage of using per-operative gonioscopy.

Conclusions: Cyclodialysis clefts are rare and most ophthalmologists see few cases in their careers. The principles of management are to restore apposition of the detached ciliary body to the sclera, thereby restoring normal intra-ocular pressure. A wide range of options are available for management of this sight-threatening condition, with very variable results and no gold standard treatment available. Direct cyclohexy is one such method, and is illustrated in our video presentation. Adequate visualization of the defect with a goniolens during surgery ensures complete cleft closure and avoids the need for further surgical intervention or laser.

P661 ABSTRACT WITHDRAWN

P662 CANALOPLASTY IN PRIMARY OPEN-ANGLE AND PSEUDOEXFOLIATION GLAUCOMA – ONE-YEAR RESULTS IN ICELAND

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Background: To assess the safety and efficacy of canaloplasty with a flexible microcatheter (iTrack-250A) and sodium hyaluronidate 1.4% (Healon GV) in patients with primary open-angle glaucoma (POAG) and pseudoexfoliation glaucoma (PXG).

Methods: In a retrospective study, a total of 34 patients with medically uncontrolled open-angle glaucoma (OAG), 16 patients with POAG and 18 patients with PXG, underwent primary canaloplasty with a flexible microcatheter. A complete circumferential dilatation of Schlemm's canal (SC) with sodium hyaluronidate was performed. A 10-0 Prolene suture was retracted through the SC and tightened, leaving tension on the canal and trabecular meshwork. An ultrasound device was used to verify tensioning and stretching of the canal. The follow-up data referred to a mean period of 18 months (range 12 to 32 months).

Results: The mean preoperative intraocular pressure (IOP) in the POAG group was 28.2 ± 5.6 mmHg and 33.4 ± 8.2 mmHg in the PXG group. The mean postoperative IOP at 12 months was 15.5 ± 8.1 mmHg in patients with POAG and 13.6 ± 6.8 mmHg in patients with PXG. The number of medications dropped from 2.8 ± 1.2 before surgery to 0.5 ± 1.0 after surgery ($p < 0.001$). Intra- and postoperative complications were similarly rare in the two groups and included Descemet's membrane detachment in 1 eye, elevated IOP in 1 eye and microhyphema in 2 eyes. In 2 eyes circumferential catheterization of the SC was impossible. In those 2 patients, argon laser trabeculoplasty had been performed in the past.

Conclusion: Canaloplasty seems to be a promising and equally effective surgical procedure in patients with POAG and PXG. At one year follow up IOP levels are in the low-to-mid-teens. The procedure can be regarded as safe, but has its own profile of complications.

Surgical Treatment: Cyclodestruction

P663 EFFECT OF DIODE LASER TRANSSCLERAL CYCLOPHOTOCOAGULATION IN THE MANAGEMENT OF SECONDARY GLAUCOMA

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Objective: To evaluate the effect of diode laser transscleral cyclophotocoagulation (TSCPC) in eyes with secondary glaucoma in a tertiary care hospital in Karachi, Pakistan

Methods: This was a retrospective chart review of 42 eyes of 36 patients who underwent TSCPC for secondary glaucoma during May 2008 and October 2009. We assessed the success rate of the treatment (proportion of eyes achieving an IOP reduction of ≤ 22 mmHg with or without medication) and reduction in the mean number of glaucoma drugs used.

Results: The mean age at TSCPC was 47 ± 20 years (12-85). The mean follow-up was range 4 to 6 months). The indications for TSCPC were silicone oil induced glaucoma (19 eyes), advanced glaucoma (9), rubeotic glaucoma (4), neovascular glaucoma (1), post-PKP glaucoma (1), CRVO (3), posttraumatic glaucoma (2), juvenile glaucoma (1) and congenital glaucoma (1). The mean (\pm SD) pre-TSCPC IOP was 38.4 (9.4) mmHg (range 21–58 mmHg). This reduced to 16.3 (8.5) mmHg (range 4-50) after TSCPC. Overall, 35 of 42 (83.3 %) eyes achieved an IOP of ≤ 22 mmHg as a result of TSCPC. The average number (\pm SD) of anti-glaucoma drugs used decreased from 2.5 (0.8) to 1.2 (1.1)

Conclusion: Our study supports previous findings that TSCPC is an effective means of controlling IOP in patients with secondary glaucoma.

P664 A RANDOMIZED COMPARATIVE STUDY OF THE SAFETY AND EFFICACY OF CONVENTIONAL VERSUS MICROPULSE DIODE LASER TRANSSCLERAL CYCLOPHOTOCOAGULATION IN REFRACTORY GLAUCOMA

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Objectives: The objective of this study is to compare the safety and efficacy of conventional and micropulse diode laser transscleral cyclophotocoagulation (TCP) in the treatment of refractory glaucoma. Specifically, it aims to compare the intraocular pressure (IOP) lowering effects and the incidence of ocular complications associated with each.

Study design: Prospective, randomized controlled trial.

Study population: All patients with refractory, end-stage glaucoma, unresponsive to alternative treatments.

Methods: Patients with refractory glaucoma having IOP of > 21 mmHg on maximal tolerated medical therapy with or without previous surgical intervention and visual acuity of 6/60 or worse were randomized into two groups, conventional diode or micropulse diode TCP. Conventional TCP setting was 1.5-2 Watt (W), 2 second(s) duration per pulse, with an average of 20-28 pulses per eye delivering 60-112 Joules (J) per treatment. Micropulse TCP was set at 2 W, 100s pulse envelop with 0.5 ms ON and 1.1 ms OFF delivering 62.6 J per treatment. After the procedure, patients were reviewed at intervals of 1 day, 1 week, 1 month, 3 months, 6 months and 18 months. At every visit, best corrected visual acuity

(BCVA), detailed anterior segment examination, IOP, number & type of medication/s were noted. Re-treatment was done in patients where IOP reduction was < 30% from baseline after 4 weeks. Measures of efficacy included IOP reduction from baseline, number of medications before treatment and at end of study and success defined as reduction in IOP > 30% from baseline and IOP < 21 mmHg, with or without topical IOP lowering medications. Rate of complications was the measure of safety.

Results: Fifty-one (51) patients were treated. Twenty-five eyes were randomized to conventional TCP and 26 to micropulse TCP. Mean follow-up period was 17 months \pm 1.6 for both groups. Baseline IOP in the conventional group was 37.9 ± 11.4 and 41.6 ± 15.1 in the micropulse group. At 18 months follow-up, IOP was recorded at 20.9 ± 13.8 mmHg (conventional) resulting to $48.2 \pm 30.9\%$ drop vs. 19.8 ± 4.7 mmHg (micropulse) amounting to $49.8 \pm 12.2\%$ IOP reduction ($p = 0.07$ Student's *t* test). The number of medications pre-laser was 1.9 ± 0.9 for conventional and 2.1 ± 1.0 for micropulse. There was no significant difference in the number of eye drops (1.2) in both arms during the final follow-up. Success rate was 78% for conventional TCP and 85% for micropulse TCP. In conventional TCP, there were 5 cases of hypotony, 5 with prolonged uveitis, 1 had phthisis bulbi, 4 developed scleral thinning and 7 cases of loss of BCVA. Only 1 eye suffered scleral thinning in micropulse TCP treated eyes.

Conclusion: Micropulse TCP has equal efficacy in terms of IOP lowering compared to conventional TCP. It offers better safety profile with fewer complications after treatment.

P665 MINIATURIZED HIGH-INTENSITY FOCUSED ULTRASOUND DEVICE FOR THE TREATMENT OF GLAUCOMA: A CLINICAL PILOT STUDY

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Purpose: To evaluate the safety and efficacy of high-intensity focused ultrasound delivered by miniaturized annular transducers in patients with refractory glaucoma.

Design: Prospective non comparative interventional clinical study.

Methods: Eight eyes of 8 patients with refractory glaucoma and uncontrolled intraocular pressure (IOP) were insonified using a ring comprising a six-sector transducer. UBM and a complete ophthalmic examination were performed before the procedure, and at 1 day, 1 week, 1, 3 and 6 months after the procedure.

Main Outcomes Measures: Intraocular pressure reduction and intra- or post-operative complications.

Results: IOP was reduced from a mean preoperative value of 36.2 ± 7.4 mmHg ($n = 2.9$ glaucoma medications) to a mean postoperative value of 26.5 ± 5.7 ($n = 2.7$), 24.8 ± 9.9 ($n = 2.7$), 26.9 ± 6.6 ($n = 3.0$), 29.6 ± 8.5 mmHg ($n = 2.8$) and 25.2 ± 14.8 mmHg ($n = 2.8$) at 1 day, 1 week, 1, 3 and 6 months respectively. No major intra- or post-operative complications occurred. UBM showed cystic involution of the

ciliary body in 6 of the 8 eyes, and a suprachoroidal fluid space in 2 of the 8 eyes.

Conclusions: Ultrasonic coagulation of the ciliary body using high-intensity focused ultrasound delivered by a circular miniaturized transducer seems to be a promising and well-tolerated method to reduce intraocular pressure in patients with refractory glaucoma.

P666 CYCLOPHOTOCOAGULATION IN TREATMENT OF PATIENTS ILL WITH SECONDARY PHACOMORPHIC GLAUCOMA WITH HIGH INTRAOCULAR PRESSURE

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Backgrounds: The lowering of intraocular pressure (IOP) at secondary phacomorphic glaucoma is very important step before phacoemulsification at the initially high IOP figures. The purpose of our work was to study the effectiveness of cyclophotocoagulation (CPC) at secondary phacomorphic glaucoma with high intraocular pressure as the stage of surgical treatment. 49 patients ill with secondary phacomorphic glaucoma aged from 51 to 69 years were observed. The preoperative IOP varied from 36 to 52 mmHg on combined hypotensive regimen. Anterior chamber angle was totally closed in all cases.

Methods: All patients have undergone transscleral CPC with the help of diode laser with the wave length of 810 nm and power of 1800-200 watt. The number of coagulates was 18-25.

Results: All operations past uneventfully. The IOP decreased and made less than 23 mmHg without hypotensive regimen in 37 patients in early postoperative period. IOP varied from 24 to 29 mmHg in 12 patients on hypotensive regimen. Later all patients underwent phacoemulsification of swelling cataract with IOL implantation.

Conclusion: The application of transscleral CPC allows achieving IOP normalization in patients ill with secondary phacomorphic glaucoma with high intraocular pressure thus optimizing the conditions of the following phacoemulsification.

P667 A NEW TECHNIQUE FOR DIODE LASER CYCLOPHOTOCOAGULATION: SHORT-TERM RESULTS

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Background: To evaluate the efficacy of a new technique for diode laser cyclophotocoagulation in refractory glaucoma.

Methods: A consecutive case series of 8 eyes of 7 Caucasian patients who underwent gonioscopy assisted diode laser cyclophotocoagulation (GADC). GADC with a peripheral corneal approach is a new surgical technique that employs a manual gonioscopy, iris hooks, ophthalmic operating microscope and an 810 nm laser diode probe usually utilized for retinal photocoagulation (Figs 1-3).

Results: The mean follow-up time was 5.9 months (range 3 to 11 months). Mean intraocular pressure (IOP) (\pm SD) was reduced from 24.5 ± 4.3 mmHg to 11.25 ± 1.7 mmHg. The mean number of IOP lowering eye drops (\pm SD) was reduced from 2.0 ± 0.8 preoperatively to 0.8 ± 0.5 postoperatively. The visual acuity remained unchanged in 7 of 8 eyes (87.5%) and deteriorated in 1 of 8 eyes (12.5%). Early complications

included IOP spike in one patient. No major complications were encountered. No eyes required repeat cyclophotocoagulation.

Conclusion: Gonioprism assisted diode laser cyclophotocoagulation with peripheral corneal approach appears to be an effective and safe surgical treatment of refractory glaucoma and has the advantage of no requiring of new endoscopic devices.

P668 ENDOSCOPIC CYCLOPHOTOCOAGULATION: TWELVE-MONTH OUTCOME DATA FROM A LARGE GLAUCOMA UNIT IN THE UK

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Background: Endoscopic Cyclophotocoagulation (ECP) is a surgical technique that aims to reduce the intraocular pressure (IOP). It involves selective ablation of the aqueous-secreting ciliary body tissue with light endoscopy permitting direct visualisation of laser application. The procedure can be performed alone or more usually combined with phacoemulsification. Advantages include a more precise application of laser and a reduced risk of hypotony and phthisis bulbi. It has the associated disadvantages of intraocular surgery, including risks of endophthalmitis, choroidal hemorrhage and retinal detachment. This retrospective audit shows 12-month ECP outcome data from a large Glaucoma unit in the UK.

Methods: 42 patients and 42 eyes were treated between November 2008 and January 2010 by 2 surgeons using a standard technique. ECP was administered alone or combined with phacoemulsification. The indications for treatment, mean change in IOP at 3, 6, 9 and 12 months, complications and further interventions after ECP for IOP reduction were noted.

Results: The commonest indication for treatment with ECP was primary open-angle glaucoma, followed by chronic narrow angle glaucoma, uveitic glaucoma and trauma. The mean age at treatment was 68 years (range 18-90). ECP was carried out either alone (15 patients) or combined with phacoemulsification (27 patients). The mean IOP reduction was 7.5 mmHg, 8.6 mmHg, 9.1 mmHg and 9.4 mmHg after 3, 6, 9 and 12 months respectively. The procedure was uncomplicated in 67% of cases. 6 patients (14%) underwent further interventions for IOP reduction (and were subsequently excluded from the IOP analysis. Complications included immediate high IOP (5 patients) uveitis (4 patients, 1 of which exhibited fibrinous uveitis) and hypotony (1 patient), cystoid macular edema (1 patient) and aqueous misdirection (1 patient), vitreous strand extending to wound (1 patient) and retained healon (1 patient).

Conclusions: ECP has a beneficial effect on the IOP and can be combined readily with cataract surgery. One variable in this audit is the effect that cataract surgery might have on the IOP, independent of ECP. The IOP lowering effect of ECP is less immediate than that seen in external diode however effects persist over the 12-month follow-up period.

P669 INTERMEDIATE-TERM OUTCOME OF ENDOSCOPIC CYCLOPHOTOCOAGULATION (ECP) IN GLAUCOMA

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Background: ECP was initially recommended for refractory glaucoma. More recently, it was suggested that it can be useful in combination with cataract surgery in some patients. Short-term studies have reported reasonable IOP lowering and a low rate of visually threatening/devastating complications.

Aim: To evaluate the intermediate-term outcome and complications of ECP, including cases where it was performed as a primary glaucoma procedure combined with cataract extraction.

Methods: A retrospective chart review included 44 eyes of 41 patients who had undergone ECP with & without cataract surgery at a single tertiary care level institution with a minimal follow-up period of one year. The Main outcome measures were IOP and number of anti-glaucoma medications, post-operative complications and need for further glaucoma procedures.

Results: 44 eyes of 41 patients were included. 18 eyes (40.9%) had CACG, 13 (19.5%) had POAG, 5 (11.4%) had pseudoexfoliative glaucoma, 2 (4.5%) aphakic glaucoma, 2 (4.5%) had NVG and the remaining 4 eyes (9.2%) had other types of glaucomas. 32 eyes (72.7%) had no prior intraocular surgery. 41 eyes (93.1%) underwent combined cataract extraction with ECP. The mean follow-up was 29.9 (\pm 10.67 SD) months. 20 eyes (45.5%) had advanced glaucomatous optic nerve damage. The mean preoperative IOP was 18.75 mmHg (\pm 9.26 SD) compared with 15.72 (\pm 4.1SD) at the last follow-up (P = 0.76) & the number of preoperative anti-glaucoma medications was 2.9 (\pm 0.98 SD) compared to 2.03 (\pm 1.4 SD) at last follow-up (p = 0.001). Kaplan-Meier survival analysis curve showed a probability of success of 95.5% at one year, 81.8% at two years & 59.1 % at three years. The most frequent postoperative complications were: fibrinous reaction in 7 eyes (15.9%), IOP spike > 30 mmHg in 7 eyes (15.9 %), serous choroidal detachment in one eye (2.3%) and suprachoroidal hemorrhage ending in phthisis bulbi in one eye with absolute neovascular glaucoma (2.3%). No further glaucoma surgery was performed in any eye.

Conclusion: ECP seems to offer a good option to decrease IOP and reduce the need for anti-glaucoma medications in a variety of glaucomas, even when performed in combination with cataract extraction.

P670 NOVEL CRYODESTRUCTIVE TECHNIQUE FOR REFRACTORY GLAUCOMA TREATMENT

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Background: To evaluate the clinical effectiveness and safety of new cyclodestructive procedure in eyes with refractory glaucoma.

Methods: Interference was performed in 15 eyes of 15 patients with primary and secondary painful glaucoma. The intraocular pressure (IOP), eyeball pain, number of glaucoma medications, side effects, and complications of the procedure were all recorded during the follow-up period. The following technique of the operation was used. A fornix based conjunctival flap was prepared in inferior part of a limbus. 4 applications 1 mm posterior to the limbus and 4 applications 4 mm posterior to the limbus was made (60 s, 2.5-mm-diameter cryoprobe). 1.5 mm transparent scleral incision 3 mm from limbus was performed. Goniocyclodolysis with spatula was

carrying out. Then 0.3 ml of sodium hyaluronate 1.0% (Provisc, Alcon) was entered in cyclodialysis cleft. The operation was over by putting two nodal sutures on conjunctival flap.

Results: We observed no serious intraoperative and post-operative complications. Follow-up time range from 6 to 14 months, mean 9.3 months. The mean IOP significantly decreased, from 37.7 ± 11.5 mmHg to 19.8 ± 6.4 mmHg at the end of the observation period. The mean reduction in the number of anti-glaucoma medications was 1.2 ± 1.0 . The eyeball pain intensity was notably reduced in all cases.

Conclusion: Our technique seems a safe and effective for refractory painful glaucoma.

P671 DIODE AND SEE: AN AUDIT OF THE USE OF TRANSSCLERAL DIODE LASER CYCLOABLATION IN EYES WITH PREDOMINANTLY GOOD VISION

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Background: Transscleral cyclophotocoagulation is widely used for patients with refractory glaucoma and poor visual potential. Its use in patients with good vision is however less well documented.

Methods: A retrospective case note review over a two year period in a single unit. All procedures were performed under local anesthetic with the Quantel 810 nm diode laser.

Results: 30 patients were identified. Mean power used was 76 joules. 22 patients had pre-laser visual acuity of 20/30 or better. After a mean follow up of 9 months, mean pre-laser intraocular pressure reduced from 26.3 mmHg to 14.7 mmHg post-laser. Mean number of medications used reduced from 3.0 to 1.9 post-laser. Only 3 patients lost 1 line of Snellen visual acuity which may represent normal inter-test variability. There was one case of persistent hypotony in a patient with pre-laser visual acuity of hand movements.

Conclusion: These results suggest that transscleral diode laser cycloablation possibly has a role in the management of selected eyes with uncontrolled intraocular pressure and good visual acuity.

P672 TRANSSCLERAL CYCLODIODE LASER IN PATIENTS WITH 'DRIVING VISION'

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Background: Intraocular pressure (IOP) control can be achieved with medication, laser trabeculoplasty or surgery. However, in certain patients, these procedures are inadequate or unsuitable. Historically, cyclodiode laser therapy has been reserved as a last resort option and has not been popular for the control of IOP in relatively healthy eyes with good visual acuity. The aim of this study was to investigate the outcome of cyclodiode for glaucomatous eyes with elevated IOP and 'driving vision' (Snellen acuity 6/12, 20/40, 0.3 LogMAR or better).

Methods: A retrospective chart review of successive transscleral cyclodiode laser procedures in eyes with a preoperative vision of at least 6/12 (0.3 LogMAR) was performed. Significant exclusion criteria were: simultaneous procedures (e.g., cataract surgery), and follow-up duration of less than 6 months. A standard treatment protocol was utilized, with

each eye receiving 40 burns of 1500 mW power and 1500 ms duration over 360 degrees, avoiding the 3 and 9 o'clock positions and sites of previous surgery. All procedures were performed under peribulbar or sub-Tenon's local anesthesia, using lidocaine 2%. Treatments were performed using the contact G-probe for transscleral cyclophotocoagulation with the Iris Medical OcuLight 810-nm laser system from Iridex. Transillumination was used to identify the ciliary body band.

Results: Fifty-one eyes of 42 patients with a mean age of 82.1 years (standard deviation (SD) 7.2, range from 66 to 97 years) at the time of their first cyclodiode laser treatment were included. During the mean follow-up time of 23.5 months (SD 16, range 6 to 75) a mean of 1.3 (range 1-3) procedures were performed per eye. Pre-laser mean IOP was 21.6 mmHg, (SD 6.4, range 14-58), and the mean number of glaucoma medications prescribed was 2.5 (SD 1.2). Final mean IOP was 13.2 mmHg, (SD 3.2, range 7-21), using a mean 1.8 medications (SD 1.2) and in 5 (all) patients pre-laser prescribing of systemic acetazolamide was stopped. Early post-laser adverse events occurred in 19/51 eyes (37%) or 18/42 patients (43%) and were: epitheliopathy (6), cystoid macular edema (7), recurrent herpetic corneal ulcer (1), prolonged iritis (4), posterior vitreous detachment (1), unexplained decreased vision (2) or high intraocular pressure (1). At final follow-up 'driving acuity' was maintained in 47 of 51 eyes (92%). Forty-two eyes (82%) had no significant change in visual acuity (the same, or within one Snellen line of the pre-laser acuity). Two Snellen lines were lost in 5 eyes, ≥ 3 lines loss occurred in 4 eyes (bullous keratopathy, cataract with previous macular edema, progression of glaucoma and one unexplained vision loss). There were no cases of hypotony, but one patient developed chronic cystoid macular edema.

Conclusion: Cyclodiode laser treatment appeared to be reasonably safe in this cohort of patients with good visual acuity. Cyclodiode should be considered in patients who need improved IOP control, especially if other less invasive therapeutic modalities have failed or patients are considered to be poor candidates for surgery.

P673 INVESTIGATION OF KINETIC INTRAOCULAR PRESSURE CHANGE AFTER DIODE LASER TRANSSCLERAL CYCLOPHOTOCOAGULATION TREATMENT IN MIDTERM OBSERVATION: A PROSPECTIVE STUDY

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Background and Objective: Diode laser transscleral cyclophotocoagulation (TSCP) is widely used on refractory glaucoma patients. Main aim of this study is to investigate the kinetic intraocular pressure change after TSCP in a midterm observation.

Patients and Methods: A prospective, non-comparative interventional pilot study was conducted. 54 eyes of 54 consecutive refractory glaucoma patients were enrolled and treated with TSCP. TSCP retreatment was performed if the IOP was still above 30 mmHg 3 weeks after the initial TSCP. IOP measured with GAT, visual acuity and medication were recorded before treatment and at each follow-up. Treatment strategies and outcomes were analyzed. A 12-month IOP curve was delineated for single and multiple TSCP-application group.

Results: The mean \pm SD intraocular pressure decreased

from 45.9 ± 13.0 mmHg pre-treatment to 18.8 ± 9.0 mmHg at the 12th month follow-up. 77.8% (42) of the eyes received single application and 22.2% (12) received multiple applications. In single and multiple application groups, IOP decrease from 45.0 ± 13.6 mmHg and 49.0 ± 10.4 mmHg at baseline to 18.3 ± 8.5 mmHg and 20.5 ± 10.8 mmHg at the 12th month follow-up, separately. IOP curves of the two groups showed trend of confluence about 6 months after initial retreatment. **Conclusions:** Diode laser transscleral cyclophotocoagulation is effective on refractory glaucoma patients. IOP of Single- and multi- application group have difference path but showed a trend of confluence 6 months after the initial treatment.

Surgical Treatment: Anesthesia

P674 TOPICAL LIDOCAINE VERSUS ROPIVACAINE IN COMBINED PHACOEMULSIFICATION WITH EXPRESS IMPLANT

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Background: To assess the anesthetic efficacy and safety of topical ropivacaine versus topical lidocaine in Phacoemulsification combined with ExPress Implant.

Methods: Twenty patients were operated for combined cataract and glaucoma surgery. All patients were randomized into two groups. The group one (ten patients) was treated pre-operative with topical ropivacaine 1%. The group two (ten patients) was treated pre operative with topical lidocaine 4%. Intraoperative and postoperative patients subjective pain was expressed, using a pain scale.

Results: Surgery time and intraoperative complications were the same in both groups. Four patients in the ropivacaine group and 5 in the lidocaine group required supplement with intraocular 1% lidocaine anesthesia ($p > .05$). The mean subjective analog pain score was slightly higher in the lidocaine group ($p > .05$).

Conclusions: The efficacy and safety of topical ropivacaine was at least as well as topical lidocaine for Phacoemulsification combined with ExPress Implant surgery. In our study the Ropivacaine was enough long-lasting analgesia during combined glaucoma and cataract surgery. Most of our patients didn't require the supplement of intracameral anesthesia during surgery. Topical Ropivacaine seems the best and long lasting anaesthetic drug for combined glaucoma and cataract surgery.

Surgical Treatment: Other

P675 DIODE LASER CYCLOPHOTOCOAGULATION AND AHMED GLAUCOMA VALVE IMPLANT WITH INTRACAMERAL BEVACIZUMAB (AVASTIN) IN TREATMENT OF NEOVASCULAR GLAUCOMA

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Purpose: To assess the efficacy, safety of IOP reduction, pain and rubeosis regression by Diode laser cyclophotocoagula-

tiopn (DCPC) and Ahmed glaucoma valve (AGV) implant with 1mg (0.08ml) intracameral bevacizumab through paracentesis by MVR 20.

Methods: 40 patients with neovascular glaucoma 20 for each group between Feb 2008 to Aug 2010 underwent either DCPC or AGV implantation with intracameral avastin. All patients underwent baseline complete ophthalmological examination. IOP measurement by Goldmann applanation Tonometry preoperatively, 1 week, 1 month, 3 months and 6 months. Pain was assessed in each visit according to grades of faces as in Wong Baker scale. Rubeosis was adopted the grading system of NVI that was proposed by Teich and Walsh, 1981.

Results: the preoperative IOP was 43.4 ± 11.9 mmHg and 43.3 ± 7.4 mmHg for the DCPC and AGV groups, respectively. The postoperative IOP was 16.5 ± 11.3 mmHg and 22.09 ± 7.6 mmHg for DCPC and AGV groups respectively. Pain was improved in both groups. NVI was regressed for 3 months. The total success rate was 80% in both groups. Complications included anterior segment inflammation in 5 eyes in DCPC group and hyphema in 6 eyes in AGV group.

Conclusion: No significant difference in the success rate between DCPC and AGV in neovascular glaucoma treatment. Intracameral Avastin is rapid, safer and effective in iris rubeosis regression but a temporary effect.

P676 DEEP SCLERECTOMY IN TERMINAL OPEN-ANGLE GLAUCOMA

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Purpose: To study the safety and effectiveness of deep sclerectomy in terminal open-angle glaucoma.

Methods: This non-randomized prospective trial comprised 16 eyes of 11 patients with medically uncontrolled terminal open-angle glaucoma (stage 4 or 5 from the Mills classification). Deep sclerectomy (DS) with implant associated with viscocanalostomy (VCS) was performed. Visual acuity, IOP, slit lamp and gonioscopy examinations were performed before as well as 1 and 8 days and 1, 3, 6, 12, 18, 24, 30 months post-operatively. Visual fields were performed at 12 months. Complete success (CS) was defined as IOP ≤ 21 mmHg, ≤ 18 mmHg, ≤ 16 mmHg or decrease of IOP $\geq 40\%$ without adjunctive medication and qualified success (QS) was defined as IOP ≤ 21 mmHg, ≤ 18 mmHg, ≤ 16 mmHg or decrease of IOP $\geq 40\%$ with or without medication. Intraoperative and postoperative complications were recorded.

Results: The mean IOP dropped from 28.6 ± 10 mmHg pre-operatively to 15.3 ± 3.6 mmHg at 12 months (mean decrease of IOP: 46.5%) and 70% of eyes had a decreased of IOP $\geq 40\%$. At 12 months the qualified success rate of an IOP ≤ 21 mmHg, ≤ 18 mmHg and ≤ 16 mmHg was 90.9%, 72.7% and 60% respectively. Laser goniotomy was performed on 5 eyes. The number of medications dropped from 2.9 ± 0.7 (25% with oral medication) before surgery to 0.9 ± 1.0 after surgery. No eye lost vision.

Conclusion: Deep sclerectomy is a safe and effective technique in terminal open-angle glaucoma.

P677 TWELVE YEARS RESULTS OF DEEP SCLERECTOMY WITH USE OF ANTIMETABOLITES IN OPEN-ANGLE GLAUCOMA

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Purpose: To evaluate the long-term success rate and complications of non penetrating deep sclerectomy with use of antimetabolites in open-angle glaucoma.

Patients and Methods: Clinical, nonrandomized, unmasked study of 94 patients with medically uncontrolled glaucoma from one center. A standard procedure of deep sclerectomy with antimetabolites (used according to EGS recommendations) was performed. The procedure consists of a non penetrating deep sclerectomy with either limbal based or fornix based conjunctival incision. Complete examinations were performed before surgery and postoperatively at 1 and 7 days; 1, 2, 3, 6, 9, and 12 months and then every 6 months for 10 years. Several parameters were analysed including intraocular pressure (IOP), post operatives complications, and visual field analysis.

Results: Average preoperative IOP was 24.1 ± 6.7 mmHg, with 1-3 anti-glaucoma medications over 9.0 ± 6.8 years. The average post-op IOP was: 7.1 ± 4.2 mmHg at the 1st post-op day; 12.1 ± 5.2 mmHg, 1 month post-op; 13.2 ± 4.1 mmHg, 6 months post-op; 13.5 ± 5.1 mmHg, 1 year post-op; 13.1 ± 2.9 mmHg, 3 years post-op; 13.6 ± 3.2 mmHg, 5 years post-op; 13.0 ± 2.8 mmHg, 10 years post-op, 13.5 ± 2.2 mmHg, 12 years post-op. An IOP ≤ 21 mmHg without medication was achieved in 52 % patients and a total of 83% with or without treatment. Anti-glaucoma treatments were reintroduced on a mean follow up of 8 years in 21% of cases. Early iris incarceration was seen in 9.5% of cases. Late iris incarceration was seen in 9.5% of cases. 35% of cases had a goniotomy. Needling with 5FU was done for 5.3% of cases. 18% of eyes needed a 2nd glaucoma surgery. Cystic bleb was seen in 6.4% of cases. 6.3% of eyes needed cataract surgery. The visual field was stabilised in 84% of cases. Although the long term IOP level with NPDS may not be as low as with trabeculectomy, the short term complications with NPDS may be fewer and less severe because sudden decompression of the globe is avoided.

Conclusions: On the basis of 12-year follow-up deep sclerectomy with antimetabolites demonstrated its efficacy in controlling IOP with few postoperative complications with a low incidence (6.3%) of cataract development.

P678 DEEP MICROPERFORATING SCLERECTOMY

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Background: Since it was described, the non-penetrating deep sclerectomy (NPDS) has good results, but is hard to learn. This surgery has been improved with YAG laser perforations post-op, or the use of implants during surgery. We want to show a modification of this technique to improve its results.

Methods: We have modified the NPDS into microperforating deep sclerectomy (MPDS) and performed it in 45 patients, with the intention of improving the hypotensive effect, without needing any other procedure or use of implants. This modifications consist in the microperforation of the trabeculo-

descemet membrane, with a 30-g needle, turning this membrane into a net, with better outflow into the subconjunctival bleb, and less resistance to aqueous outflow, keeping the security of the NPDS.

Results: From the 45 patients, 10 where converted to trabeculectomy. There was no case of hypotony, flat chamber, choroidal detachment or endophthalmitis, keeping pressures between 16 ± 4 in a 6-month follow-up.

Conclusion: The MPDS is a safe modification of the NPDS, has no extra cost for the patient or the learning curve, and has shown good results in hypotensive effect and safety.

P679 LONG-TERM RESULTS OF MECHANICAL NEUROPROTECTION OF THE OPTIC NERVE IN PATIENTS WITH FAR-ADVANCED GLAUCOMA

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Background: This work was devoted to analysis of long-term results of the mechanical neuroprotection of the optic nerve in the surgical treatment of glaucoma with the use of biological material based on bone collagen Xenoplast.

Methods: Xenoplast for the perineural scleroplasty represents plates size $10.0 \times 20.0 \times 1.0$ mm made of pure bone collagen type I animal genesis. The ability of this material to bio-integration provides the improvement of the biomechanical characteristics of sclera in the posterior segment of the eyeball and decrease of the deforming loading on the optic disk. It has been investigated 124 patients (132 eyes) with far-advanced stage of the disease, operated by perineural scleroplasty with the material Xenoplast combined with non-penetration deep sclerectomy (NPDS) (1 group) and 45 patients (47 eyes) with far-advanced stage of the disease (2 group), operated by perineural scleroplasty with the material Xenoplast after surgery normalized IOP. Group of comparison (group 3) 20 patients – 25 eyes with an initial stage of the disease, operated by NPDS without perineural scleroplasty by material Xenoplast.

Material: Xenoplast for perineural scleroplasty is moved into subtenon space in 3 or 4 quadrants between straight muscles to the posterior segment of the eyeball, and NPDS was performed in upper-internal meridian. Follow-up period was 24 months. Visual acuity, visual field, b-scan and OCT of the posterior part of the eyeball were determined.

Results: By data Ocular Response Analyzer (ORA) IOP c.c. decreased from 25.2 mmHg before surgery to 16.2 mmHg after surgery. Corneal hysteresis increased from 6.3 before surgery to 8.6 after 24 months after surgery. Optic disc excavation decreased from 0.73 to 0.67 by OCT data after 12 months and after 24 months returns to the initial level (0.78). Volume of the optic disc excavation decreased from 0.64 before surgery to 0.59 24 months after surgery. Nerve fibers thickness increased from 43.1 and 48.9 before surgery to 49.7 and 51.7 in the nose and lower quadrants 24 months after surgery. Visual functions remained stable during the period of observation.

Conclusion: The use of the biological material based on the bone collagen Xenoplast with perineural scleroplasty allows to carry out the neuroprotection of the optic nerve in the glaucoma. In the result achieves the stabilization of size of the optic disc excavation and nerve fibers thickness of the retina.

P680 TORIC IOLS TO CORRECT ASTIGMATISM IN EYES WITH FILTERING BLEBS

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Background: Trabeculectomy surgery increases the risk of astigmatism and cataract. A toric intraocular lens (IOL) can help correct astigmatism and improve uncorrected vision. The toric IOL has been studied extensively in routine cataract surgery but not in patients with glaucoma who have undergone a previous trabeculectomy.

Methods: The AcrySof SN60T (3, 4, or 5) toric IOL (Alcon Laboratories, Inc.) was implanted in 12 eyes of 9 patients who had undergone previous trabeculectomy for treatment of uncontrolled glaucoma. Astigmatism was measured in each eye with manual and automated keratometry, topography, and manifest refraction. The power and axis of the toric IOL selected for implantation was based on an assessment of all the data. The uncorrected visual acuity (UCVA), the best-corrected visual acuity (BCVA), and lens alignment were measured at least 4 months after cataract surgery.

Results: The average age was 63 ± 10.1 years. The mean follow-up was 14.0 ± 5.4 months. The T5 toric IOL was used in seven eyes, the T4 in three eyes, and the T3 in two eyes. The mean preoperative refractive astigmatism was 2.23 ± 1.32 diopters (D) in all eyes, 1.25 ± 0.73 D in the T3 group, 1.75 ± 1.06 D in the T4 group, and 2.71 ± 1.38 D in the T5 group. The mean postoperative refractive astigmatism was 0.44 ± 0.63 D in all eyes, 0.0 D in the T3 group, 0.25 ± 0.35 D in the T4 group, and 0.64 ± 0.71 D in the T5 group. The mean BCVA in all eyes was 0.39 ± 0.43 (LogMAR) preoperatively and 0.04 ± 0.06 postoperatively. The mean postoperative UCVA was 0.21 ± 0.29 (LogMAR) in all eyes. A postoperative UCVA of 20/20 was achieved in 6 eyes (50%) and 20/40 or better in 9 eyes (75%). The mean difference between the intended alignment of the toric IOL and the measured alignment was 3.4 degrees (range 0 to 10 degrees). No eye required IOL rotation postoperatively. The mean preoperative intraocular pressure (IOP) in all eyes was 12.1 ± 5.0 mmHg and the postoperative IOP was 14.7 ± 4.8 mmHg. No patient has required further glaucoma surgery. The average mean deviation on the visual field testing preoperatively was 7.82 dB (range 1.82 to 16.28 dB). Five eyes had mean deviations of greater than 10.0 dB. Complications included one subconjunctival hemorrhage from the marking of the eye prior to toric IOL implantation. One patient had chronic hypotony both before and after cataract surgery. Despite an eventual normal IOP, she continued to have irregular astigmatism and required a hard contact lens for a BCVA of 20/25.

Conclusions: The toric IOL can be used effectively to correct astigmatism in patients who have previously undergone trabeculectomy for uncontrolled glaucoma. The alignment of the toric IOL was close to the intended axis and appeared stable. Cataract surgery with a toric IOL reduced astigmatism and improved BCVA and UCVA even in patients with substantial glaucomatous visual field loss.

P681 THIRD-FLAP DISSECTION IN VISCOCANALOSTOMY

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Background: Viscocanalostomy as a non-penetrating glaucoma surgery depends on subcleral filtration of the aqueous. Since it was proposed by Stegmann in 1990, it aimed to avoid the short and long term complications of trabeculectomy. The aqueous leaves the eye through the normal physiological pathway, so it is considered a near physiological shunt. Advantages of viscocanalostomy: 1. Lack of direct entry to the AC: less risk of infection, cataract, hypotony and flat anterior chamber. 2. Absence of external filtration. 3. Rapid visual recovery. Disadvantages of viscocanalostomy: Steep learning curve and high failure rate (if not well practiced).

Methods: Mastering the surgical technique takes a long steep curve, avoiding early Descemet's membrane perforation guarantee a better anatomical details and in turn a better surgical outcome.

Added difficulties may be encountered as when dissecting in bloody field, sunken globe, extended pannus or thick sclera. In the above mentioned cases dissecting a third flap can facilitate the window creation and improve the outcome of the procedure. Simply on approaching the canal of Schlemm, if it was found that the: 1. deep scleral flap is not passing through the roof of the canal of Schlemm; 2. also if the pannus masks the expected position of the canal; 3. thick deep scleral flap that is difficult to manipulate at the canal and window area; 4. if the flap passes very deep and causes excessive bleeding. Third flap dissection can solve this dilemma. Once a difficulty is faced, the deep (second) sclera flap is intentionally carried on at a more superficial plane than the classic technique. The bed at that time will be a thin layer of the sclera and the cornea that can be dealt with easily. Using the capsulorhexis forceps, the residual sclera fibers are dissected centrally; where the canal will be deroofted easily. The third flap is dissected to expose the whole extent of the canal. A cellulose sponge is used to detach the Schwalbe's line, alternate between sharp dissection at the sides and blunt dissection at the bed till we get a good window. Now we have a good window and three flaps. The third flap and the second (deep) flap are excised then Sodium Hyaluronate is injected into the canal of Schlemm. The superficial flap is replaced and sutured by 10/0 Vicryl and the conjunctiva is approximated.

Results: The surgical skills in Viscocanalostomy can be improved greatly by adherence to the technique and respecting the small details that ensure a better outcome. Intraoperative flexibility and ability to change tactics can guarantee the desired outcome.

Conclusion: The longer operation time for viscocanalostomy compared to trabeculectomy is easily compensated for postoperatively by the smooth postoperative course and the comparable results with minimal early and late postoperative complication.

P682 MINICANALOSTOMY IN PRIMARY OPEN-ANGLE GLAUCOMA 'FARIED APPROACH'

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Purpose: To evaluate the efficacy of a new modified technique in viscocanalostomy as a non-penetrating surgery in primary open-angle glaucoma.

Methods: This modified technique applied for 50 eyes of 30 patients (35-46 years with a mean age of 40 years) with uncontrolled primary open-angle glaucoma by medical therapy.

Results: Follow-up period up to one year revealed significant reduction in intraocular pressure (IOP) as p value < 0.001 with complete success in 86 % of cases while qualified success in 14% of cases. Visual field stability occurred in majority of cases. Regarding intraoperative complications: Descemet's membrane detachment (6%), Ocular hypotony (2%) and hyphema (2%).

Conclusion: Farieds miniviscocanalostomy is an effective non-penetrating glaucoma surgery in controlling IOP with significant visual field stability and potentially reduced risk of sight-threatening complications.

P683 INTRAOCULAR PRESSURE PROGNOSIS FOLLOWING PENETRATING KERATOPLASTY FOR EYES WITH GLAUCOMA OR WITHOUT GLAUCOMA

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Background: Intraocular pressure elevation following penetrating keratoplasty (PK) is related to poor visual outcome and graft failure. We examined intraocular pressure elevation after uncomplicated penetrating keratoplasty.

Methods: We reviewed medical records of patients that had undergone uncomplicated PK at Keio university hospital between January 1, 2007 and December 31, 2008. Exclusion criteria were PK for penetrating ocular trauma and follow up period less than 1 year after PK. Baseline glaucoma was defined as receiving hypotensive medications or history of glaucoma surgeries at the time of PK. Intraocular pressure elevation PK was defined as intraocular pressure higher than 21 mmHg with or without hypotensive medications within a year after PK.

Results: A total of 157 eyes in 145 patients were included in the study. 132 eyes had no glaucoma or intraocular pressure elevation. 25 eyes had glaucoma at baseline and 12 eyes had a history of glaucoma surgeries (filtration surgery: 10, other surgeries: 2). Intraocular pressure elevation within 12 months after PK was occurred in 45 eyes of 132 eyes without baseline glaucoma (34%), 13 eyes of 25 eyes with baseline glaucoma (52%). There was a statistically significant difference between intraocular pressure elevation rate between two groups (p = 0.04). Glaucoma surgeries within 12 months after PK were performed to none of 132 eyes without baseline glaucoma (0%), to 12 of 25 eyes with baseline glaucoma (48%). There was a statistically significant difference between intraocular pressure elevation rate between two groups (p < 0.001). There was a statistically significant difference between intraocular pressure elevation rate between two groups (p < 0.001). Graft clarity at 12 month visit were 83% in eyes without baseline glaucoma, 80% in eyes with baseline glaucoma.

Conclusion: Baseline glaucoma was a poor prognostic factor of PK in the point of intraocular pressure control. However, it wasn't a poor prognosis factor of PK in the point of corneal graft clarity.

P684 A NEW MICRO-INVASIVE PROCEDURE FOR PRIMARY GLAUCOMA TREATMENT

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Background: The purpose of this study is to evaluate the safety and efficacy of a novel minimally invasive surgical technique in primary open-angle glaucoma (POAG) treatment.

Methods: This was a prospective consecutive case series on 24 patients (24 eyes) with uncontrolled POAG without previous ocular surgery. A complete ophthalmologic examination was performed before surgery and during the subsequent observation. A follow technique was used. At first a limbus-based conjunctival flap was performed. Then superficial scleral flap was cut out on 2/3 thickness size 4x4 mm. At the base of sclera bed the area of trabecular meshwork and Schlemm's canal projection was perforated with Bipolar Intrastromal Diathermal Keratostomy (IDK) Micro-needle connected to a Bipolar Diathermal Glaucoma Unit (Oertli, Switzerland) with a fixed IDK adjustment (3 Watt developed experimentally). Open-and tunnel diameter of 0.2 mm was generated. Electric current was applied until the aqueous flow comes out from the tunnel made. This procedure was repeated 3 times. The superficial scleral flap was fixed with 2 nodal sutures towards the sclera bed border (3 mm posteriorly to limbus) that creates a roller. The operation was completed with watertight suture in the conjunctival incision.

Results: Patient follow-up ranged from 8 to 15 months. The average term observation was 12.5 months. The mean pre-operative IOP was 26.8 ± 6.7 mmHg. There was no serious intraoperative surgical advance event. At the end of 1 week after operation mean IOP was reduced to 11.8 ± 5.5 mmHg in 91.7% (22 eyes) without hypotensive drops. There were 2 cases of transitory IOP elevation which resolved after medical treatment. The mean IOP reduction stabilized on 13.9 ± 5.9 mmHg at 6 months follow-up. At the last visit complete success rate defined IOP ≤ 21 mmHg without medications was 91.7% (22 eyes). Only 2 eyes returned to hypotensive medication.

Conclusion: This study reports the initial experience with a novel approach to surgical glaucoma therapy. This new operation created with high-frequency diathermic probe is a minimally invasive penetrating surgical technique that provides IOP reduction with less intra- and postoperative complications.

P685 INTRAOCULAR PRESSURE AND VISUAL ACUITY OUTCOMES FOLLOWING CATARACT EXTRACTION OF PHACOMORPHIC GLAUCOMA CASES

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Background: Phacomorphic glaucoma may develop in patients, whom unwilling for a surgical intervention due to old age, systemic diseases and preferring family support instead of surgery. An intumescent lens could push the iris forward and shallow the anterior chamber or cause pupillary block and secondary angle-closure glaucoma. The clinical picture include a history of deteriorated vision, red eye and severe pain around the eye. Although the medical therapy decreases the intraocular pressure, the definitive treatment is cataract extraction.

Methods: A retrospective analysis of 51 consecutive acute phacomorphic glaucoma cases between the years 2003-2010, was performed at Yüzüncü Yıl University Ophthalmology Department. All patients underwent an eye examination of visual acuity, slit-lamp biomicroscopy, applanation tonom-

etry before and after surgery and B-mode ultrasonography, for posterior segment evaluation.

Results: The mean age of the 51 patients was 72.8 (52- 89) years and 27 (53.1 %) of them were female and 24 (46.9 %) were male. The preoperative mean intraocular pressure (IOP) was 45.3 mmHg before the operation. The mean intraocular pressures had been 13.1 mmHg in the first postoperative day and 12.6 mmHg for the 7. postoperative day. Visual acuities were no light perception (NLP) in 13 (25.6 %) patients, light perception and projection (+) was 29 (56.7 %) patients; in 9 patients visual acuity was between hand movements and finger counting at 5 meters before the operation. Planned extracapsular cataract extractions were performed in 36 (70.1 %) patients. Intracapsular cataract extraction was conducted in 9 (17.6 %) and phacoemulsification in 6 (12.3 %) patients. During the first postoperative week, the visual acuity was no light perception in 8 (15.6 %) and light perception and projection (+) in 3 (5.8 %) patients. Thirty patients had visual acuities between hand movements and finger counting at 5 meters; 10 (20.2 %) patients had visual acuity better than 0.05.

Conclusion: In most of the patients with phacomorphic glaucoma, the visual acuity improved after the cataract extraction and the mean intraocular pressure decreased substantially in the first and the seventh day after the surgery. Although there are some improvement in visual acuity and IOP after the surgery; phacomorphic glaucoma poses some risks including expulsive hemorrhage and zonular dialysis.

P686 EXCIMER LASER TRABECULOSTOMY (ELT). CLINICAL UPDATE 2011

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Background: Excimer Laser Trabeculostomy is a minimally invasive, outpatient surgical procedure which corrects the anatomical pathology responsible for most open-angle glaucoma: Outflow obstruction at the juxtacanalicular trabecular meshwork and the inner wall of Schlemm's canal. The goal of ELT is to reestablish the natural aqueous flow of the eye without inciting a healing response at the target tissue. Similar to LASIK, Excimer lasers can remove tissue in the angle, trabecular meshwork, and sclera while causing almost no thermal damage, unlike all prior lasers used to treat the angle tissues. An added benefit is pneumatic canaloplasty.

Methods: In a non-randomized [one site] clinical trial, a total of 80 eyes underwent ELT. 32 eyes of 32 phakic patients (group 1) and 15 eyes of 15 pseudophakic patients (group 2), with open-angle glaucoma, pseudoexfoliative glaucoma or ocular hypertension underwent ELT surgery alone. 33 eyes of 33 phakic patients underwent combined ELT with cataract surgery (group 3). A fiberoptic probe was introduced through a paracentesis to contact the trabecular meshwork. ELT was performed using a non-thermal, 308 nm xenon-chloride, excimer laser on one eye per patient to excise the trabecular meshwork, the juxtacanalicular trabecular meshwork and the inner wall of Schlemm's canal.

Results: The results of ELT show that it safely and effectively produces a continued reduction in IOP in all patient groups. After 3 years, in group 1, mean pre-operative IOP was 27.72

(± 5.95 mmHg) with an average of 2.44 (± 1.27) topical medications. Mean post-operative IOP was 15.89 (± 3.29) at 3 years. IOP-lowering medications were reduced to 0.21 (± 0.40) at 3 years. In group 2, mean pre-operative IOP was 26.73 (± 6.360 mmHg) with an average of 2.93 (± 1.33) topical medications. Mean post-operative IOP was 14.10 (± 3.87) at 3 years. IOP-lowering medications were reduced to 0.67 (± 0.62) at 3 years. In group 3, mean pre-operative IOP was 21.03 (± 4.36 mmHg) with an average of 1.47 (± 0.72) topical medications. Mean post-operative IOP was 13.16 (± 1.46) at 3 years. IOP-lowering medications were reduced to 0.45 (± 0.60) at 3 years.

Conclusion: Excimer Laser Trabeculostomy (ELT) is a promising, minimally invasive technique for the treatment of open-angle glaucoma which safely and effectively lowers IOP in the long-term by increasing the mobility of the aqueous fluid through the trabecular meshwork, Schlemm's canal and collector channels as well as reducing medication requirements with a very low complication rate.

P687 PHACOEMULSIFICATION WITH VISCOGONIOPLASTY AS PRIMARY MANAGEMENT OF NARROW ANTERIOR CHAMBER DRAINAGE ANGLE

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Background: Phacoemulsification with viscosgonioplasty (Phaco-VGP) has been shown to be helpful in management of patients with narrow angle and previous peripheral iridotomy (PI). (Varma D, Adams WE, Phelan PS, Fraser SG. Br J Ophthalmol. 2006, & Varma D, Adams W, Bunce C, Phelan P, Fraser S. Clin Ophthalmol. 2010). We present outcomes for Phaco-VGP in eyes that have not had previous PI.

Methods: Retrospective review of case-notes. We included all patients who had phaco-VGP without prior PI or any other surgery/laser, with documented narrow angle pre-operatively, and at least six months of follow-up. The technique of phaco-VGP involves physically opening the anterior chamber drainage angle with viscoelastic, after phacoemulsification. Following implantation of the intra-ocular lens, the anterior chamber is re-filled with viscoelastic, taking care to deepen the angle. Viscoelastic is removed and surgery completed as normal. We review our patients after 1 day, 1 week, and 1 month, with post-operative medications as clinically indicated. We looked at outcomes after six months.

Results: 21 eyes (21 patients) were eligible for review. Diagnoses were primary angle closure, primary angle-closure glaucoma and acute angle-closure glaucoma. There was 1 per-operative complication (minor iris capture during phaco). The one post-operative complication, was elevated intraocular pressure (IOP) in a patient who had run out of medications. There were no unscheduled visits. Mean intra-ocular pressure was 20.74 pre-operatively (SD 5.11, range 16-34), and mean IOP at 6 months was 14.86 (SD 2.92, range 11-22). Number of IOP-lowering medications pre-operatively was 1.19 (SD 1.22, range 0-3), and at 6 months was mean 1.05 (SD 1.17, range 0-3). For the 13 patients who were using IOP-lowering medications pre-operatively, 2 (15%) had stopped all glaucoma medications at a 6 months. For the 8 patients who were not using IOP lowering medications pre-operatively, 1 patient ended up on 1 drop. Overall for the 21 patients, 29% had fewer glaucoma medications, 57% had no

change and 14% had increased number of glaucoma medications. There were no additional IOP-lowering procedures in the follow-up period.

Conclusion: Viscogonioplasty appears to be a safe and effective procedure for patients with narrow angle who undergo cataract surgery. Phaco-VGP can be performed in selected patients, without the need for peripheral iridotomy prior to surgery.

P688 A COMPARISON OF THE SCLERAL LAKE HEIGHT BY ANTERIOR SEGMENT OCT USING SEVERAL IMPLANTS IN DEEP SCLERECTOMY

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Background: The purpose of this study has been to perform an analysis of the relationship between deep-sclerectomy (DS) intrascleral blebs height and IOP with three different types of implants using the Visante™ anterior segment (AS) OCT.

Methods: This is a cross-sectional study in 61 eyes that underwent uneventful DS with intraescleral implant. Eyes were divided depending on the implant that was used: 19 eyes (31.14%) in the SKGel™ group, 22 eyes (36.06%) in the Esnoper™ group and 20 eyes (32.78%) in the Aquaflow™ group. The intraocular pressure (IOP) measurement and the scan with the Visante™ AS-OCT were performed by the same operator (RF) on the same day in all the patients. Scans were performed through the scleral bleb at 45°, 90° and 135°.

Results: The mean follow up after surgery was 15.82 (SD 13.76) months. Overall the mean postoperative IOP was 12.94 (SD 3.98) mmHg. The median scleral bleb height at 45° was 0.650 (SKGel™), 0.570 (Aquaflow™) and 0.660 (Esnoper™) ($p = 0.297$). At 90° the median scleral bleb height was 0.630 (SKGel™), 0.630 (Aquaflow™) and 0.650 (Esnoper™) ($p = 0.760$). Finally at 135° the sclera bleb height was 0.670 (SKGel™), 0.650 (Aquaflow™) and 0.670 (Esnoper™) ($p = 0.611$). The correlation between the scleral bleb height and the IOP was statistically significant in all measurements ($r = -0.359$; $p = 0.004$ at 45°; $r = -0.410$; $p = 0.001$ at 90° and was $r = -0.417$; $p = 0.001$ at 135°).

Discussion: Recently, Mavranakas et al. reported an inverse positive correlation between sclera bleb height and IOP in 25 eyes presenting clinically flat blebs following DS with collagen implant. Several resorbable and non-resorbable implants have been implanted to maintain a patent intrascleral space. In the current study, we obtained similar results in a large sample of patients using 3 different implants. Intrascleral bleb height is related to the success of DS, suggesting for intrascleral filtration an important role in lowering IOP.

Conclusions: There is an inverse significant correlation between the scleral bleb height at 45°, 90° and 135° and the IOP measurement after uneventful DS with any of the evaluated scleral implants without differences between them.

P689 CILIARY BODY ATROPHY AFTER NON-PENETRATING DEEP SCLERECTOMY

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Background: The purpose of this study was to identify the clinical and anatomic characteristics of filtering blebs after non-penetrating deep sclerectomy (DS) using ultrasound biomicroscopy (UBM), and to evaluate its influence on IOP control.

Methods: We conducted a prospective interventional case-series in 94 eyes (79 patients), which have undergone non-penetrating deep sclerectomy with implant. A complete ophthalmic examination and ultrasound biomicroscopy exploration were performed at 1, 3, 6 and 12 months postoperatively. Surgery success was defined as IOP < 18 mmHg. Analytic and correlation statistical analysis was made using non-parametric tests.

Results: IOP significantly reduced from a median preoperative of 23 mmHg to a median postoperative IOP of 12 mmHg ($p < 0.001$). Mean number of drugs was significantly reduced at all follow-up periods ($p < 0.001$). One year after surgery ciliary body atrophy on surgery site was found in 32% of patients. Although this sign was not significantly correlated itself with lower IOP levels ($r = -0.19$ $p = 0.07$), the frequency of ciliary body atrophy increases proportionally to the number of filtering criteria in patients with surgical success after a year of monitoring. Thus, patients with 0 filtering criteria one year after surgery have a 0% of the ciliary body atrophy, in patients with 1 filtering criteria 18.2% of the ciliary body atrophy, in patients with 2 filtering criteria 18.8% of ciliary body atrophy and in patients with 3 filtering criteria 41.3% of the ciliary body atrophy. Simultaneous UBM filtration criteria are strongly correlated with lower IOP levels one year after surgery ($r = -0.72$, $p < 0.001$).

Conclusion: Ultrasound biomicroscopy is a useful method to evaluate outflow mechanisms after non-penetrating deep sclerectomy and their correlation with IOP postoperative control. Uveoscleral filtration has higher paper in surgery success at mid-term after surgery. Ciliary body atrophy on surgery site could be a new way of IOP reduction after DS.

P690 OUTCOME OF BLEB REVISION USING DONOR SCLERAL PATCH GRAFT VERSUS PARTIAL THICKNESS AUTOLOGOUS SCLERA

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Purpose: To evaluate our surgical technique of bleb revision using donor scleral patch graft and partial thickness autologous sclera; the safety and efficacy of the techniques and; control and maintenance of intra ocular pressure (IOP).

Design: Prospective Non-Randomized Surgical Intervention Control Trial.

Participants and Methods: The patients were divided into Group A (4 cases with donor scleral patch graft) and Group B 4 cases with partial thickness autologous sclera) depending on the technique used. All patients had anti-metabolite (MMC/5FU) augmented filtration surgery at least a year ago and presented with leaking blebs (Seidel's test positive) and hypotony. All cases of Group A were secured with fixed sutures. Partial thickness autologous sclera was refashioned over the revised bleb covering the defect and sutured tightly at the limbus. No cautery was used in either of the techniques.

Results: The mean age was 55 (range 48 to 62 years). The mean follow-up period was 11.5 (range 7 to 16 months). The

mean preoperative IOP was 8 mmHg in the Group A and 7.5 mmHg in Group B. The IOP was well controlled more than 10 and less than 21 on all follow-ups with or without topical medications in all patients of both the groups.

Conclusions: We conclude that both the techniques of donor scleral graft and partial thickness autologous sclera are safe and effective with well controlled IOP postoperatively. However, the disadvantages in procurement and expense of donor sclera must be weighed against the advantages of autologous scleral graft which are no risk of rejection, disease transmission, procurement and eyebanking issues.

P691 FILTERING SURGERY: NEW TRENDS FOR BETTER RESULTS

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Purpose: To improve efficacy and safety of filtering surgery, both trabeculectomy (Trab) and deep sclerectomy (DS), adopting rules of Moorfields Safer Surgery System (SSS) in to surgical technique and adjunctive Bevacizumab (Avastin) in postoperative management.

Methods: Consecutive case series of 38 eyes in 25 patients. Trab or DS were performed using fornix based conjunctival flaps, Tenon's dissection around and over superior rectus to achieve a sub tarsal bleb. Trab carried as usual 5x4 scleral flap and DS a 6x5 superficial scleral flap. As an antimetabolite Mitomycin C (MMC) 0.2 mg/ml was applied under conjunctival posterior flap and scleral flap for 2 minutes. Both techniques are achieved as classical procedures. Releasable sutures of the scleral flap. Sodium Hyaluronate (Healon GV) as device in to conjunctival posterior flap and intraescleral space and conjunctival closure-corneal anchoring sutures were performed. Two eyes of high risk patients received Bevacizumab subconjunctival intraoperative. Intensive post-operative care (first month), including bleb needling and subconjunctival injections (5 Fluorouracil, Bevacizumab). Visante AS-OCT (Carl Zeiss Meditec) and Ultrasound Biomicroscopy (UBM) were performed in order to control the surgical area of both techniques and the diffuse bleb with posterior outflow appearance. Primary outcome of surgical failure was defined by two criteria 1) need for further surgery, glaucoma medications or intraocular pressure (IOP) ≥ 21 mmHg and 2) IOP ≥ 16 mmHg in case of lower IOP target.

Results: The last postoperative IOP was 10.53 ± 1.95 mmHg (range: 6; 15). Mean follow-up 8 months (2; 14 months). Early postoperative complications were 5 choroidretinal detachment (Trabs 4, DS 1), 3 macroscopic hyphema (Trabs 2, DS 1), 1 iris synechia to descemet window (DS reoperation), 1 iris synechia to the ostium (Trabs reoperation), 2 goniosynechiolysis with laser(DS), 3 goniopuncture (DS), 12 needle revision adding antimetabolites and Bevacizumab injection (Trabs 7, DS 5). Complications were few, keeping the safe outcome of Non Penetrating procedures and the better post-op of Trabs with the SSS (0% hypotonic after 2 weeks post-op; 0% Seidel; 0% blebitis or endophthalmitis)

Conclusion: Filtering surgery perforant or not perforant well indicated and accurate performed provides excellent IOP control (6; 15 mmHg) enhancing DS indications to high risk glaucomas, always keeping its rates of safety in the short and medium outcomes.

P692 THE EFFECTIVENESS OF EARLY LENS EXTRACTION WITH INTRAOCULAR LENS IMPLANTATION FOR THE TREATMENT OF PRIMARY ANGLE-CLOSURE GLAUCOMA: A RANDOMIZED CONTROLLED TRIAL (EAGLE STUDY DESIGN)

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Background: Glaucoma is the leading cause of irreversible blindness. Although primary open-angle glaucoma is more common, primary angle-closure glaucoma (PACG) is more likely to result in irreversible blindness. By 2020, 5.3 million people worldwide will be blind because of PACG. The current standard care for PACG is a stepped approach of a combination of laser iridotomy surgery (to open the drainage angle) and medical treatment (to reduce intraocular pressure). If these treatments fail, glaucoma surgery (e.g., trabeculectomy) is indicated. It has been proposed that, because the lens of the eye plays a major role in the mechanisms leading to PACG, early clear lens extraction will improve glaucoma control by opening the drainage angle. This procedure might reduce the need for drugs and glaucoma surgery, maintain good visual acuity, and improve quality of life compared with standard care.

EAGLE aims to evaluate whether early lens extraction improves patient-reported, clinical outcomes, and cost-effectiveness, compared with standard care

Methods: EAGLE is a multi-center pragmatic randomized trial. Inclusion criteria are:

– Diagnosis: either one of the following two types of patients: (1) primary angle-closure glaucoma (PACG) with IOP ≥ 21 mmHg or (2) primary angle closure (PAC) with IOP ≥ 30 mmHg. – Angle closure (iridotrabecular contact), either appositional and/ or synechial in 180 degrees or more. – Phakic – Age over 50 years. Patients with severe glaucoma (MD worse than -15 dB), cataract, co-morbidity increasing the surgical risk of lens extraction, or history of acute angle closure attacks are excluded.

The primary outcomes are EQ-5D, intraocular pressure, and incremental cost per quality adjusted life year (QALY) gained. Other outcomes are: vision and glaucoma-specific patient-reported outcomes, visual acuity, visual field, angle closure, number of medications, additional surgery (e.g., trabeculectomy), costs to the health services and patients, and adverse events. A single main analysis will be done at the end of the trial. The analysis will be based on all participants as randomized (intention to treat). 400 participants (200 in each group) will be recruited, to have 90% power at 5% significance level to detect a difference in EQ-5D score between the two groups of 0.05, and a mean difference in intraocular pressure of 1.75 mmHg. The study will have 80% power to detect a difference of 15% in the glaucoma surgery rate.

Results: At the time of the abstract submission 257 participants have been enrolled.

Conclusions: EAGLE is an ongoing international multi-center pragmatic RCT that will compare laser iridotomy versus early lens extraction in PACG.

P693 POSTOPERATIVE HYPOTONIC OPTIC NEUROPATHY – REVERSIBLE MORPHOLOGICAL AND FUNCTIONAL CHANGES

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Background: We describe the evolution of a clinical case of papillary edema as a complication of filtering surgery with excessive ocular hypotonic effect. This type of papillo-edema is classified as secondary optic neuropathy due to mechanical intraocular alterations. Other recognized causes are perforation wounds or blunt globe contusions.

Methods: 47 years-old male who suffered an eye injury 3 months ago underwent combined surgery in his right eye without intraoperative incident. Visual acuity (VA) before the treatment was 0.8 and intraocular pressure (IOP) was 35 mmHg. The last few weeks before the surgery, the IOP was controlled unsatisfactorily with anti-inflammatory treatment, topical ocular and systemic hypotensive medication. During the immediate postoperative period the healing course was satisfactory. IOP ranged between 4 and 8 mmHg and VA was 0.5. The tenth day VA suddenly decreased to counting fingers. Biomicroscopy examination revealed corneal edema with folds in Descemet's membrane and the study of ocular fundus showed disc swelling and choroidal folds that not change the foveolar area. The OCT image confirmed a healthy macula. The Ishihara color test was not altered. In the visual field (VF) large peripheral contraction was seen.

Results: After the surgical revision and re-suturing of the scleral flap the IOP stabilized at 14 mmHg. With the gradual resolution of exudative and hemorrhagic components the morphology of the optic disc was recovered and followed by VA improvement (0.6). The disappearance of the mechanical pressure on the nerve fibers also normalized the VF appearance.

Conclusions: The hypotonic optic neuropathy is an uncommon complication of filtering surgery which may interfere with the patient's visual function and implicate poor surgery outcome. The visual field changes are attributable to severe depression of visual sensitivity due to the blockade of axonal flow at the lamina cribrosa level. The defect in the VF is recoverable and does not represent an absolute scotoma.

P694 FIVE-YEAR FOLLOW-UP OF THE NON-PENETRATING INTRACANALICULAR PARTIAL TRABECULECTOMY VIA THE OSTIA OF SCHLEMM'S CANAL

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Background: In order to distinguish a more pronounced and sustained hypotensive effect of non-penetrating glaucoma surgery, a modified surgical procedure is proposed, which provides enlargement of the filtration membrane area with maximal maintenance of natural aqueous outflow pathways. A long-term effect of the procedure is evaluated five years after the surgery.

Methods: In 21 eyes of 17 patients with open-angle glaucoma (intraocular pressure – IOP: 32.4 ± 4.7 mmHg; age: 69.2 ± 4.4 years) the following non-penetrating surgery was performed. After the excision of the outer wall of Schlemm's canal outer layers of the trabecular meshwork were removed with a trabecular spatula at the site of the open area of Sch-

lemm's canal. A cannula-harpoon was introduced through both Schlemm's canal ostia between the less permeable and well-permeable trabecular layers and separating them. Due to the harpoon configuration of the cannula the superficial less permeable trabecular layers were removed within Schlemm's canal adjacent to its ostia during the retracting movement of the cannula. Thus the filtration zone becomes extended using the outflow pathways into Schlemm's canal.

Results: An intraocular pressure of 15.5 ± 2.3 mmHg after five years of follow-up was measured in the group. In 13 patients (17 eyes, 81%) the hypotensive effect was absolute (without additional procedures or medications). Because of IOP elevation over the threshold of 18 mmHg in 4 patients (4 eyes, 19%) 3-4 years postoperatively YAG-goniopuncture was carried out in the site of filtration. Two patients of these are under monotherapy after this procedure.

Conclusions: The results of the follow-up demonstrate a pronounced and sustained long-term hypotensive effect of the modified surgery technique and show that this surgery can be applied successfully in patients with therapy resistant open-angle glaucoma. Further studies with larger case numbers are needed for generalized conclusions.

P695 A CASE OF PLATEAU IRIS SYNDROME; ASSOCIATED WITH TREATMENT RESISTANT GLAUCOMA

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Background: It is aimed to present a case of plateau iris syndrome who had bilateral glaucoma resistant to medical treatment.

Methods: The patient was a 17-year-old girl. She had family history of glaucoma. She had prescribed anti-glaucoma medications by another clinic. She presented with complaint of decreased vision on her left eye since three months. The visual acuity was 10/10 OD and hand motions OS. The slit lamp examination was normal for the right eye, but revealed diffuse corneal edema for the left eye. The intraocular pressure (IOP) was 18 mmHg OD, 40 mmHg OS. The fundus examination showed normal disc appearance for the right eye, and total cupping for the left eye. The central corneal thickness was 580 μ m OD, and 591 μ m OS. The ultrasound biomicroscopy showed bilateral plateau iris configuration.

Results: The patient was hospitalized, was given intravenous mannitol, oral acetazolamide 4x1 tb po and topical pilosed %2 3x1gtt for her left eye. A YAG iridotomy procedure was performed for the left eye. A argon laser peripheral iridoplasty procedure was done for uncontrolled raised left IOP. During follow-up, the left IOP continued to increased despite combined anti-glaucoma medications. The patient was undergone to a shunt operation to control the IOP. At the first day postoperatively, the severe narrowing of the left anterior chamber was occurred due to overfiltration. A second operation was performed to rebuild the anterior chamber depth. During the procedure, the scleral flap site was resutured, and secured with fibrin glue, and 0.2 cc of SF6 was given into the anterior chamber to maintain its depth. During follow-up, the IOP of the right eye was also raised. A YAG iridotomy, and argon laser peripheral iridoplasty procedure were performed respectively. Despite laser treatment, and combined medications, the control of the right IOP could not be obtained. She had to undergo to a successful trabeculectomy with mit-

mycin. The IOP was bilaterally under control without any medications at the last visit.

Conclusion: The plateau iris syndrome is one of the rare but serious causes of glaucoma. The diagnosis is often difficult, requires careful examination and clinical suspicion which must be supported by ultrasound biomicroscopy examination. Glaucoma associated with plateau iris configuration may be recalcitrant, and may result profound vision loss without any clinical significant signs or symptoms. The clinician must be aware, and able to distinguish the clinical appearance.

P696 NON PENETRATING DEEP SCLERECTOMY (NPDS) WITH SILICONE POROUS IMPLANT

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Background: One of the most frequent causes of failure of NPDS is fibrosis of the superficial flap and closure of scleral bed. There is a general effort to develop new types of implants combined with antimetabolites. According to our good experience we suggest a new type of implant-maintainer. It is a silicone porous implant non-absorbable measuring 4.0 mm x 4 mm, thickness 0.7 mm placed in the scleral bed.

Method: Retrospective chart review of patients with POAG undergone NPDS with silicone implants after one year post-operatively. 260 eyes of 260 patients (68.0 ± 9.3 years old) operated in 2005-2010 in 1st Microsurgery department of Ophthalmology, Kyrgyz National Hospital. Mean pre-op IOP was 33.6 mmHg.

Results: No serious complications were noted in operated patients. One year after surgery the new IOP for all eyes was 17.1 ± 4 mmHg.

Conclusion: In this study we found that NPDS with silicone implants is safe and effective technique to reduce IOP and probably avoid secondary collapse of the superficial flap.

P697 EFFECTIVENESS OF THE EX-PRESS MINI GLAUCOMA SHUNT IN THE TREATMENT OF PRIMARY OPEN-ANGLE GLAUCOMA

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Objectives: To demonstrate the effectiveness of the EX-PRESS mini glaucoma shunt in the treatment of primary open-angle glaucoma refractory to medical treatment. Also compare the use of mitomycin C 0.02% versus Ologen as an adjunct to surgical technique. Finally we analyze the complications of implant.

Material and Methods: This is a prospective observational study of 20 eyes of 17 patients with primary open-angle glaucoma, is not satisfactorily controlled with drug treatment. The surgery was performed by the same surgeon. The monitoring period is one year.

Results: The mean age of patients in the study was 70.45 years, 40% of patients were male. The pre-surgical intraocular pressure (IOP) was 27.85 ± 5.93 mmHg, the IOP one year after the implantation of the Ex-press was 15.35 ± 4.45 mm reach statistical significance ($p < 0.005$). IOP also a week, one month and six months after surgery was statistically significantly decreased. The number of drops (active ingredi-

ents) before surgery was 3.15 ± 0.48, the need for addition of drops decreased after implantation of the Ex-press up to 0.95 ± 1.05 to reach statistical significance. Although the use of mitomycin C 0.02% has not proved more effective in reducing IOP than the Ologen®, their use reduces the need for addition of anti-glaucoma eye drops after surgery, did not reach statistical significance. there were only 2 cases of hyphema, 1 athalamia and one case of peripheral anterior synechiae.

Conclusion: The Ex-press is a good therapeutic option for lowering IOP in patients who have a primary open-angle glaucoma refractory to medical treatment. The Ex-press is a safe implant with a low rate of complications, without compromising any of them the final result. The combination of improvement in the design and biomaterial used in the Ex-press device, along with an implantation technique easy, quick and safe. The Ex-press mini glaucoma shunt allows filtering surgery with a high success rate.

P698 COMPARISON OF ESNOPER® IMPLANT WITH AND WITHOUT SUPRACHOROIDAL PLACEMENT IN NON PENETRATING DEEP SCLERECTOMY

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Purpose: To compare the efficacy and safety of the Esnoper® implant in non penetrating deep sclerectomy with the implant placed in two different positions: under the scleral flap versus a portion of the implant introduced in the suprachoroidal space.

Methods: Retrospective analysis of 37 eyes of 31 patients who underwent non penetrating deep sclerectomy, being the implant Esnoper® placed under the scleral flap (in the scleral lake) in group A (15 eyes) and part of it in suprachoroidal space in group B (22 eyes).

Results: In group A, the IOP decreased from 19.6 ± 5.3 mmHg to 14.3 ± 3.0 mmHg and in group B from 19.7 ± 3.8 mmHg to 12.6 ± 4.1 mmHg ($p < 0.05$). The difference in the postoperative IOP between both groups was statistically non significant ($p > 0.05$). Anti-glaucoma medications decreased from 2.8 ± 0.4 to 0.9 ± 0.1 in group A, and from 2.7 ± 0.5 to 0.1 ± 0.4 in group B, being this difference statistically significant ($p < 0.05$). Qualified success was found in all patients (100%) in both groups. Complete success (IOP without treatment) was achieved in 7/15 (46.6%) eyes in group A and in 20/22 (90.9%) eyes in group B. The average follow-up was 13.8 ± 6.4 months for group A and 12.6 ± 4.0 months for group B. There weren't any complication in any group.

Conclusions: The IOP-lowering effect and safety of scleral and suprachoroidal Esnoper® implant seem to be comparable, but fewer anti-glaucoma medications were required with the implant partially introduced in the suprachoroidal space.

Health Economics

P699 COST EFFECTIVENESS OF GLAUCOMA MEDICATIONS AND LASER TRABECULOPLASTY IN THE TREATMENT OF PATIENTS WITH NEWLY-DIAGNOSED OPEN-ANGLE GLAUCOMA

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Background: Open-angle glaucoma (OAG) is a major cause of visual impairment worldwide. Although there are several effective treatment options for lowering intraocular pressure and preventing disease progression in patients with newly diagnosed OAG, little is known about whether these treatments are cost effective relative to observation alone and whether one treatment strategy confers the greatest value. The purpose of this study is to compare the incremental cost effectiveness of treatment of patients with newly-diagnosed OAG with prostaglandin analogs (PGAs), laser trabeculoplasty (LTP), or observation only.

Methods: Taking a societal perspective, a Markov process analysis was used to model the cost effectiveness over a 25 year time horizon of treatment of newly diagnosed patients with mild OAG using PGAs, LTP, versus observation alone. Costs and utilities that were incorporated into the model were obtained from clinical trials and population-based studies. Incremental cost effectiveness ratios were generated comparing each group with one another. Sensitivity analyses were performed to assess the impact of different model parameters including reduced medication adherence.

Results: The incremental cost effectiveness of LTP over observation only was \$ 4706/quality-adjusted life years (QALY). PGA's provided better results than LTP, but at a higher cost: incremental cost effectiveness of treatment with PGAs over LTP was \$ 25189/QALY. Assuming a willingness-to-pay of \$ 50000/QALY, if PGAs are $\geq 11\%$ less effective than the level of effectiveness recorded in Phase III clinical trials (due to patient difficulty with medication adherence), LTP is the most cost effective treatment option. If the yearly cost for PGAs is reduced 50% (when these medications become soon become generic in the United States), their effectiveness relative to that recorded in Phase III clinical trials can be 15% lower and they would be a more cost effective alternative relative to LTP.

Conclusions: PGAs and LTP are both cost effective treatment alternatives for patients with newly diagnosed mild OAG. Assuming optimal patient adherence with medications, treatment with PGAs is more cost effective relative to LTP at \$ 25189/QALY. However, when assuming more realistic levels of medication adherence, LTP may be a more cost effective alternative at today's prices for prostaglandin analogs.

P700 CHANGE IN INTRAOCULAR PRESSURE IN TEN YEARS AND ITS ASSOCIATED SYSTEMIC FACTORS OF THE HEALTHY SUBJECTS

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Background: We investigated the change of the intraocular pressure (IOP) and its associated systemic factors of healthy subjects who took health examinations in 1999 and 2008.

Methods: Subjects who had no clear history of ocular diseases and who had health examinations at Yamanashi Koseiren Health Care Center in 1999 and 2008 were enrolled. The

IOP was evaluated using a pneumatic tonometer. The right eye was chosen for the analysis. The IOP change between two examinations and its significantly associated factors were investigated.

Results: A total number of enrolled subjects were 3845 (50.9 \pm 8.6 years) including 2059 male (50.4 \pm 8.9 years) and 1786 female (51.6 \pm 8.2 years) subjects. Mean IOPs of male and female subjects in 1999 were 13.4 \pm 2.9 mmHg and 12.8 \pm 3.1 mmHg, respectively ($p < 0.0001$). The IOPs of male and female subjects significantly decreased in ten years by -0.84 mmHg and -0.58 mmHg, respectively ($p < 0.0001$). Changes in systolic and diastolic blood pressures, low density lipoprotein cholesterol, total cholesterol, body mass index, and γ GTP were positively correlated to the IOP change, while only change in ocular perfusion pressure showed a negative correlation to the IOP change.

Conclusions: The IOP of healthy subjects was significantly reduced by aging and several systemic factors were related to the IOP changes.

P701 LONGITUDINAL TRENDS IN RESOURCE UTILIZATION IN AN INCIDENT COHORT OF OPEN-ANGLE GLAUCOMA PATIENTS

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Background: Open-angle glaucoma (OAG) is a chronic, progressive, incurable disease that affects nearly 2 million individuals in the United States. It is also one of the leading causes of visual impairment worldwide and is the most common cause of blindness among African Americans. The total burden of illness for patients with OAG in the U.S. has been estimated to be nearly \$3 billion/annually. To date, nearly all estimates of the cost of care for people with OAG have been prevalence based. In this report we present an estimate of the clinical cost of care for people with incident glaucoma using a large administrative data set. In addition, we identify characteristics of those 5% of patients who have the highest clinical charges during the first two years following diagnosis.

Methods: Using the i3 InVision Data Mart dataset (Ingenix, Eden Prairie, MN) we identified patients with incident OAG and evaluated their resource consumption over five years. Incident glaucoma was defined as having a diagnosis of OAG on a visit to an eye care provider that was preceded by enrollment one year in which there was a visit to an eye care provider and no diagnosis of OAG. We stratified the sample by severity using clinical events (i.e., surgery and number of medication prescribed) as a proxy for disease severity. We totaled resource use every 6 months and plotted over five years by disease severity. We used logistic regression methods to evaluate demographic predictors of a person with OAG being in the top 5% of charges.

Results: 19,927 beneficiaries were identified who met our inclusion criteria. Total charges for glaucoma care spiked during a short time interval after diagnosis, and then dropped and showed little change over the subsequent years (see Figure). This was true of all severity categories. The costliest

5% of enrollees were responsible for 24.1% of all glaucoma-related charges in the first two years following diagnosis. These people were younger, more likely to live in the North-eastern U.S. and have ocular comorbidities.

Conclusion: Plan participants with incident OAG who were evaluated over 5 years after diagnosis consumed the greatest share of resources during the first 18 months. Following this period, resource consumption fell and it remained fairly constant after that. This was true for all strata of severity.

P702 COST/EFFECTIVENESS ANALYSIS OF A TELE-MEDICINE PROGRAM FOR THE DETECTION OF GLAUCOMA IN PRIMARY CARE CENTERS

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Purpose: Analysis of cost/effectiveness of a telemedicine program for the detection of glaucoma in primary care centers.

Methods: Cross-sectional study. Two detection methods for glaucoma were compared in a population-based randomly-selected sample of 1599 subjects from a target population of 47,500 inhabitants: opportunistic detection at the primary care center, named as 'classic screening', vs. 'screening by telemedicine'. The classic screening method was evaluated during 2008 by recording data from primary care and ophthalmic consultations of all subjects referred to ophthalmology with suspicion of glaucoma but no previous diagnosis of the disease. The telemedicine screening was assessed in the same sample during 2009 and aimed to population at risk (over 65 years or over 40 years with another risk factor). During the telemedicine program 414 subjects were examined with Heidelberg Retina Tomograph (HRT-3), Nerve Fiber Analyzer (GDx-VCC), and rebound tonometry (Icare). All subjects with at least 2 of the 3 following criteria were considered suspects and referred to a glaucoma consultation: global Moorfields Regression Analysis borderline or outside normal limits, Nerve Fiber Index value of GDx ≥ 30 , and tonometry ≥ 21 mmHg. At glaucoma consultation patients from both detection methods were classified as non-glaucoma, probable glaucoma or glaucoma. The cost of diagnosis was assessed by adding the costs of personal, infrastructure and instruments implicated in the diagnostic process. The effectiveness by calculating the detection rate and, finally, cost/effectiveness of both screening methods was compared. Sensitivity analysis was performed by estimating costs of classic screening with the detection rate in the total population.

Results: Classic screening identified and examined 165 subjects, from those only 2 were finally diagnosed as probable glaucoma. Telemedicine screening examined 414 subjects (54% participation rate), 32 cases were referred to glaucoma consultation, 8 were diagnosed of glaucoma and 9 as probable glaucoma. Detection rate was 4.1% for telemedicine screening, 1.2% for classic screening in the sample selected and 3.1% for classic screening in the population. The cost of each was as follows: primary care visit = € 15; general ophthalmic visit = € 18, ophthalmic visit with tests = € 52, telemedicine screening = € 51, and glaucoma consultation =

€ 126. The total cost of the telemedicine program was € 24,150, total cost of the classic screening in the sample was € 8,798, and total cost of classic screening in the population was 41,620 €. The cost per case detected was € 1,420 in the telemedicine screening and € 1,759 to € 4,399 by classic screening.

Conclusions: The telemedicine program offered a detection rate of 4.1%. An incremental cost of € 24,150 allowed the detection of 8 cases with glaucoma and 9 cases with probable glaucoma. Screening for glaucoma directed to population at risk maybe cost-effective.

Patient Care Issues

P703 GETTING THE DROPS IN IS AS IMPORTANT AS HAVING THE RIGHT DROPS: A STUDY ON PATIENT AWARENESS AND COMPLIANCE IN THE TREATMENT OF GLAUCOMA

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Background/Introduction: Glaucoma is a chronic progressive disease that requires patient awareness to aid compliance with treatment, in order to avoid irreversible visual field loss. The aim of our study was to identify patient satisfaction with the information provided about glaucoma, assess compliance and identify any pitfalls in drop administration and the need for more detailed counseling.

Methods: Data was collected prospectively from consecutive patients with chronic glaucoma, who attended a single glaucoma clinic at Queen Mary's Hospital, Sidcup. The patients were asked to answer a questionnaire composed of ten questions. These included their satisfaction with the information provided about their condition, the source of information and the requirement of additional information. Data was also collected on the number of drops missed during a month (calculated over a year), possible side effects from treatment, problems with compliance and drop administration and the use of compliance aids. The patients were also filmed during drop administration, to check their technique. The data was collected and analysed by a single clinician.

Results: Sixty-five patients (36 males, 29 females) completed the questionnaire. The median age range was 70-79, with 65% of patients in the age range 70-89. The diagnosis of POAG was given in 62% of patients. The majority of patients (66%) were given a single bottle of agent/s. Bimatoprost and timolol 0.25% were the most commonly used medications as single treatment and in combination, at 42% and 40% respectively. Side-effects from treatment were reported in 22% (14 out of 65 patients). Redness was the most common side effect, with soreness, itchiness, dryness, breathlessness also reported. Most of our patients rated their knowledge about glaucoma 'average' and 94% of them would have liked more information about glaucoma. Good compliance was documented in 82% of patients (53 out of 65). The remaining 18% of patients reported missing their drops 2-3 times a month, with a single patient missing the drops 4 times a week. The main issues with compliance were forgetfulness, difficulty with drop administration and social circumstances, as some drops were partly administered by others. Difficulties with drop administration were reported by 20% of our patients

(13 out of 65). Of those, 54% (7 out of 13), had difficulties with the bottle (opening, squeezing), while the rest had difficulties targeting the eye due to arthritis, tremor or poor vision. Of the 13 patients, 8 were keen to try a compliance aid. Repeat application if the eye was initially 'missed' was reported in 86% of patients (56 out of 65).

Conclusion: Although most of our patients seem to understand the importance of compliance, our study demonstrates the need for more information to be provided to patients about their condition. Following this study we have contacted the International Glaucoma Association who visited our department and supplied more information packs, compliance aids and contact cards for our patients. These are now offered routinely to all new glaucoma patients and are also available to chronic patients.

Other

P704 IMPLICATIONS OF REPEATED VALSALVA'S IN INDIVIDUALS PLAYING WIND INSTRUMENTS

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Background: Individuals playing high resistance wind instruments are subject to effects of Valsalva's manoeuvre. The effects of this manoeuvre in the eye were studied in members of a Brass Band (musical band playing wind instruments).

Method: 22 male wind instrument players who had been playing on instruments like trombone, coronet, saxophone for many years were a-symptomatic. An equal number of controls were taken of the same age and sex who used to play other musical instruments like the drums. The musicians played their respective instruments for 05 minutes. IOP was measured with a Rebound tonometer (iCare). Recording was done prior to and immediately after performance, at 10 minutes and after another 15 minutes. The entire sequence of recordings was repeated after a month also. The individuals underwent a comprehensive eye examination- pachymetry, 24 – 2 SITA Standard Humphrey perimetry and gonioscopy. Life time play duration varied from 540 hrs in 02 years to 4050 hrs in 15 years. Mean IOP at baseline was 15 mmHg, during playing – 19.41 mmHg, at 10 min – 15.73 mmHg, 15 min – 14.86 mmHg. Maximum IOP rise – 28 mmHg. Same IOP recordings were observed in both the tests.

Results: Gonioscopy of 16 band players (71.9%) showed open angles and significant clumps of pigment especially in the inferior angles suggestive of transient angle closure. In the MD, PSD values and GHT by 24-2 SITA Standard tests – no field defects were observed. Database – MS excel, SPSS version 14 used for statistical analysis. Mean and SD calculated for before the performance, during the performance, after 10 minutes of the performance and after 15 minutes of the performance for each eye separately. Paired T test – to compare baseline with the other 3 measurements was done. Time series analysis was also done. Statistical significant association was found. IOP was observed to have increased during playing & the rise was statistically significant.

Conclusion: There is significant rise of IOP while playing high resistance wind instruments. Transient angle closure

can occur with this rise of IOP and there is a possibility of acute angle closure occurring in persons with occludable angles and IOP can also rise due to angle obstruction due to released pigment in susceptible individuals.

P705 COMPLIANCE WITH MEDICATION AMONG PATIENTS WITH GLAUCOMA

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Background: Glaucoma is a major blinding disease worldwide. East Asians accounts for almost half of the world's 67 million glaucoma patients. Glaucoma is primarily treated with medication and surgery. Compliance to medication is a big problem as medication can be expensive and long term compliance can be low.

Aims: 1) to evaluate the compliance of glaucoma patients in Singapore to their medication; 2) to evaluate the relationships between compliance and patients' beliefs about glaucoma and treatment.

Methods: It was a cross-sectional, retrospective study. Interviewers administered the surveys. Patients' medication compliance was accessed using the Reported Adherence to Medication scale. Patients' beliefs about glaucoma and treatment were evaluated using the Brief Illness Perception Questionnaires and the Belief about Medicine-Specific Questionnaire.

Results: A total of 290 participants were interviewed, they were between 21 and 96 years old, and the mean was 65.2 years (SD = 11.6 years). Among participants, 158 (54.5%) were male, and 235 (81%) were Chinese. 167 (57.6%) participants had other chronic diseases, e.g., hypertension, diabetes, etc. Smokers or ex smokers accounted for 23.8% of the participants. 158 (54.5%) participants were retired. 39.3% of the participants did not continue education after primary school, while 23.4% of the participants had a degree or equivalent qualification. Only 58 (20%) participants reported to be fully compliance. Among the 232 (80%) participants who reported to be non-compliance with the medication, 15 (6.4%) reported intentional non-compliance (e.g. adjusting the doses to suit their own needs) only, 78 (33.6%) reported unintentional non-compliance only (e.g., forgetfulness), and 139 (59.9%) reported both intentional and unintentional non-compliance. Smokers or ex smokers were more likely to be non-compliant with the medication ($p = 0.003$). Mean scores of the beliefs about the medication was 6.32 (ranged from -7.25 through 20, SD = 5.31). The score indicates that participants had a weak belief in the necessity of medication compared with concerns about their use. Non-compliant participants had stronger concerns and less beliefs about the medication ($p < 0.05$).

Conclusions: The fully compliant rate is low among the glaucoma patients, and smoking habit and beliefs about the medication are two factors associated with non-compliance. In the future, effective strategies should be explored to improve patients' beliefs.

P706 ANTI-VEGF THERAPY AND FLUCTUATION OF INTRAOCULAR PRESSURE

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Aim: The main goal of this study is to investigate the fluctuation of intraocular pressure (IOP) in relation to intravitreal anti-VEGF therapy in patients with exudative age-related macular degeneration.

Methods: Retrospective evaluation of measurements of IOP was carried out using non-contact tonometry correlated to corneal thickness before, 1 hour after and 1 week after intravitreal application of Pegaptanib/Ranibizumab. Patients were divided into 2 therapeutic groups where 104 patients have been treated with Pegaptanib, 110 patients with Ranibizumab. Total number of applications was 1065.

Results: We found that IOP values significantly increased in first hour after application from 14.66 ± 0.121 (baseline) to 18.74 ± 0.240 mmHg in a range of 7 to 55 mmHg. The increase of IOP after 1 hour from application is temporary, in Pegaptanib group 1 hour after application values of mean IOP were 19.72 ± 0.42 mmHg, Ranibizumab group values of mean IOP were 17.46 ± 0.33 mmHg. However, IOP values remained high in 11.0% of patients in both therapeutic groups.

Conclusion: Therapy of exudative age-related macular degeneration is safe. The patients characterized with lasting high IOP were subjected to anti-glaucoma therapy.

P707 SYMPTOMATIC OPTIC DISC DRUSEN?

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This is a case report of a patient with unilateral nyctalopia in whom ipsilateral optic disc drusen are the only finding despite extensive investigation.

Clinical Cases

P708 CLINICAL CASE PRESENTATION

Y. Barkana

A 70 year-old generally healthy woman presented with discomfort and decreased vision in her only good-seeing right eye. She had had extracapsular cataract extraction with PCIOL 12 years previously. In this right eye visual acuity was 20/150, IOP was 34 mmHg. The external eye was quiet, cornea dystrophic but without edema. The anterior chamber was uniformly shallow. There was a sector iridectomy superiorly. Angle details could not be visualized even with forceful corneal compression with the gonioscope. There was no vitreous or choroidal pathology. The disc had 0.7 cupping. Initial treatment with pilocarpine resulted in elevation of IOP and was immediately discontinued. Subsequent IOP-lowering medications were only mildly effective. Addition of cycloplegia resulted in chamber deepening from 2.2 mm to 2.5 mm and IOP decrease to 19 mmHg. UBM and US did not reveal any significant pathology other than Elsching pearls in the capsular bag. Attempt at discontinuing cycloplegia resulted in immediate reversal of treatment effect and so it was continued. After a week IOP elevated again, and with the diagnosis of aqueous misdirection the patient was treated with pars-plana vitrectomy, hyaloidectomy and zonulotomy. During a follow-up of 4 months untreated IOP has been 10 mmHg, the chamber deep and the angle open.

This case represents a most unique example of 'malignant

glaucoma', not after recent surgery. The differential diagnosis according to the Ritch mechanistic classification of angle-closure is nicely demonstrated, with the necessary conclusion that indeed a posterior-segment source was responsible for the angle closure and chamber shallowing. The diagnosis had to be firmly established since the consequent treatment was unusual surgery in an only seeing eye.

I am aware of only one report in the literature of a similar case.

P709 EVALUATION OF OPTIC NERVE HEAD CUPPING IN THE PRESENCE OF MYELINATED NERVE FIBERS – A REAL CHALLENGE?

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A 68 year old female, a nurse by occupation presented for a glaucoma workup. She had an iridencleisis surgery in her left eye way back in 1972 when she had developed corneal edema and persistently high intraocular pressure. On examination the best corrected visual acuity was 6/6 in the right eye and 6/60 in the left eye. The intraocular pressure by applanation tonometry was 15 mmHg and 19 mmHg in the right and left eyes respectively. The anterior segment of the right eye was normal. The central corneal thickness was 530 microns. A +90 D examination revealed a cupping of 0.5 in the right eye. The rims were healthy nasally and temporally. Due to the presence of myelinated nerve fibers at the optic disc, the health of the superior and inferior neuroretinal rims could not be commented upon. (Fig. 1). Gonioscopy showed open angles with no peripheral anterior synechiae. The Humphrey Central 24-2 SITA standard visual field analysis was normal. (Fig. 2). Optical coherence Tomography showed increased retinal nerve fiber thickness in all quadrants. (Fig. 3). The patient was using Timolol 0.5% in the left eye. The cornea had epitheliopathy with features of dry eye. The central corneal thickness was 602 microns. There was a flat bleb which had pigmentation which probably incorporated the pillars of iris (iridencleisis). (Fig. 4). The chamber was normal with a cataractous lens. In addition, the inferior iris revealed multiple pigmented spots suggestive of iris naevus syndrome. The view of the left fundus was hazy and a cupping of 0.9 with very thin neuroretinal rims was noted. Due to the hazy cornea, details of gonioscopy could not be made out. Similar visual field analysis of the left eye showed superior arcuate defects. (Fig. 5). Retinal nerve fiber analysis by optical coherence tomography could not be done due to the corneal changes.

P710 SUPERIOR OPHTHALMIC VEIN THROMBOSIS MASQUERADING AS ACUTE ANGLE-CLOSURE ATTACK

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A 45 year old post menopausal lady of South Asian descent presented with congested left eye of 6 months duration along with diminished vision in the same eye for past 4 months. Her

previous treatment records revealed a baseline IOP of 42 mmHg OS and 16 mmHg OD and that she had been managed as a case of acute angle-closure glaucoma and was prescribed Brimonidine and Timolol in the OS and had undergone a YAG laser iridotomy. Due to non remittance of her symptoms the treating ophthalmologist then started her on oral steroids assuming it to be a thyroid ophthalmopathy with which she was non compliant. The patient was obese and hypertensive controlled on medications. She did not give a history of heat intolerance, weight loss or mood disturbances. There was no past history of trauma.

Examination: Her best corrected vision at presentation was 6/6 in OD and 6/24 in OS. Left eye had relative afferent pupillary defect and a proptosis of 3 mm with limitation of movement in end gazes. The right eye was apparently normal. Left eye had dilated episcleral vessels in a corkscrew configuration (Fig. 1a & 1b). Fundus examination showed dilated and tortuous veins in the left eye but there were no hemorrhages or choroidal folds. The cup: disc ratio was 0.3: 1 in the right eye and 0.5 in the LE with mild temporal pallor. The vessels in the LE showed tortuosity but there was no disc swelling in the left eye (Fig. 2). Gonioscopy showed occludable angles. The exophthalmos was non-pulsatile and no bruit could be heard in the forehead or periorbital region.

Investigations: Her Thyroid function tests (T3, T4 and TSH values) were normal and an MRI showed bulky extraocular muscles with relative sparing of the tendons. The superior ophthalmic vein on the left side showed subtle dilatation. A provisional diagnosis of a carotico cavernous fistula was made. An magnetic resonance angiography was then performed to look for any abnormal arteriovenous communication or fistula. However, no such anomalous arteriovenous communication was picked up on either of these imaging modalities. In the absence of a carotid cavernous fistula we considered treating her on lines of a Thyroid ophthalmopathy and patient was advised oral Prednisolone of 1 mg/kg dose and anti glaucoma medication. The patient was discharged.

On follow-up: Four weeks later, her vision in the left eye was reduced to 6/60. The proptosis had increased to 4 mm. There was severe conjunctival chemosis, an increase in congestion and severe limitation of eye movements (Fig. 3). The patient had developed a Cushingoid facies. Her IOP on maximal topical medication and Acetazolamide 500 mg T.DS was 50 mmHg. The patient was admitted and over the next 4 days her vision dropped to hand movement close to face. A repeat MRI was performed, but no cavernous sinus lesion was detected (Fig. 4). The patient then underwent an urgent digital subtraction angiography (DSA) that showed a small left side indirect low flow cavernous fistula that was partially thrombosed arising from the internal carotid artery along with mildly dilated superior ophthalmic vein with anterograde flow and a retrograde flow into the dural plexus (Fig. 5).

P711 CLINICAL CASE PRESENTATION

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A 72- year-old female was referred to the phaco service to determine the etiology of episodes of blurry vision in left eye. She has recently been diagnosed by few ophthalmologists for recurrent hyphemas in her left eye but they did not detect an etiology for her condition.

Her past ocular history: Pseudophakic (ECCE and PMMA

PCIOLs implantation) in both eyes 18 years ago (1994); Posterior capsulotomy by Laser Yag in left eye 17 years ago (1995); Trabeculectomy in left eye because of high IOP in left eye 14 years ago (1997). Vitreous hemorrhage diagnosed and treated with medications by an ophthalmologist in February, 2009.

Her past medical history and family history: Unremarkable.

Office Examination: When she presented to phaco service. Her BSCVA was 6/6 OD and 6/18 OS. Her IOP with applanation tonometry measured 18 mmHg OD and 28 mmHg OS. Pupil diameter was 1.5 mm OD and 3.5 mm after dilated (Fig. SLE OD1, OD2). Pupil diameter was 2.5 mm OS and fixed (Fig. SLE OS1). We noted PCIOLs in sulcus both eyes and an open posterior capsule OS. We did not see the bleb of previous trabeculectomy OS. (Fig. SLE OS 6). In her left eye, hyphema was present with 2 + cell in the anterior chamber and vitreous (Fig. SLE OS2). With transillumination, we also noted the iris defect at 2.30 o'clock with an IOLs haptic nearly exposed (Fig. SLE OS 4, 5). At the site of iridectomy at 12 o'clock in her left eye, we saw a part of IOLs optic (Fig. SLE OS3). We also observed greater cupping of the optic nerve in her left versus her right eye (Fig. FO). We did not note any blood in the vitreous. On gonioscopy, the total closed angle 360° with PAS in her left eye (Fig. Gonioscopy). On UBM, we suspected the IOLs haptic pressing between ciliary body and iris in her left eye (Video clip of UBM).

Diagnosis: Uveitis, glaucoma, hyphema (UGH) syndrome in the patient's left eye.

How would we proceed?

1/ How to manage the closed- angle glaucoma on the patient? Perform surgery? If so, what type?

2/ With her left vision 6/18, could we remove and replace the PCIOLs in the patient's left eye? If so, what type of IOLs we should use

P712 MANAGEMENT OF ACUTE ANGLE-CLOSURE GLAUCOMA IN RETINOPATHY OF PREMATURITY FOLLOWING PUPIL DILATATION – CASE REPORT

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A 5 year-old girl suffered from acute IOP elevation in the right eye following a pupil dilatation for routine retinal examination. She was a premature baby with a gestation age of 27 weeks and a body weight of 980 grams. She developed ROP, stage IV, and received scleral buckle in both eyes during infancy. Visual acuity (VA) was 20/200 in the right eye and light sense positive in the left eye. After the acute attack occurred, she had the typical ocular presentations of acute angle-closure glaucoma, including edematous cornea, shallow anterior chamber, fixed-dilated pupil, and glaucomatous flecks of the lens, etc. (Fig. 1) Ultrasound biomicroscopy (UBM) showed that the angle in the right eye was closed 360 degrees circumferentially. The IOP remained over 50 mmHg although oral diamox and maximal tolerated topical anti-glaucoma medications were treated. When the IOP control can not be achieved by the initial medical treatment following an acute attack of pupillary block, we need to advocate a surgical procedure to lower the IOP. A traditional procedure, including (a) laser iridotomy and (b) surgical peripheral iridectomy under sedation, could be an option. However, sometimes

pupillary block cannot be easily broken with this traditional procedure. If the peripheral anterior synechiae remains and the IOP remains high, additional surgical procedure is still needed. At this point, since visual prognosis was greatly demanded for this one-eye case, we had to assess all possible surgical options, including filtering procedure, glaucoma drainage, and diode cilioablation. As the patient was encircled with a scleral buckle, we also had to consider all possible technical obstacles which might be encountered during the surgical procedure. Weighing the advantages and disadvantages for each surgical option, a filtering surgery of trabeculectomy with mitomycin C was finally decided upon. With the advances in neonatology, the survival rate of premature infants with lower birth weight and lower gestation age has increased and the incidence of ROP is thereafter on the rise. Acute attack of angle-closure glaucoma is likely to occur following the pupil dilatation in patients of ROP. Management of acute angle-closure glaucoma in pediatric ROP is not as easy as management in adult patients.

P713 ABSTRACT WITHDRAWN

P714 ABSTRACT WITHDRAWN

P715 CLINICAL CASE PRESENTATION

Sinha Avinash

Introduction: Pigmentary glaucoma (PG) is a well-recognized form of secondary glaucoma caused in part by iris pigment liberation resulting in outflow obstruction. Primary PG is commonly treated with topical medications or laser trabeculoplasty. Secondary PG is becoming increasingly common in developing nations with the growing utilization of IOLs. There is minimal awareness of the relationship between IOL placement and secondary PG in the less developed world.

Summary: We report on both the development of late onset secondary PG from poor IOL placement and its surgical management.

History: A 63-year old male patient presented with history of eye strain and blurred vision in his right eye. He had manual small incision cataract surgery with IOL implantation in both eyes, over 2 years ago. There was no prior history of glaucoma.

Examination: His Best corrected visual acuity was 6/9 in RE with -3.5 DS and -3.0 D Cylinder at 180° and 6/6 with -1.75 D Cylinder at 90° in LE. The right eye's anterior segment examination demonstrated a temporal scleral tunnel, localized shallow anterior chamber superiorly for 2 clock hours, and superior anterior iris displacement. After dilatation we found an anteriorly displaced superior haptic and decentered single piece PMMA IOL. The superotemporal haptic was in the sulcus and the inferior haptic in the bag. The left eye's PCIOL was in the bag. IOPs were 36 mmHg RE and 18 mmHg LE. Gonioscopy revealed extremely heavy trabecular pigmentation for 360° with 2 hours of localized peripheral anterior synechiae superiorly in RE and minimal pigmentation with a pseudophakic depth chamber angle in the left. Fundus examination of the RE found a 0.7 cup with an inferior notch and NFL thinning and a 0.5 centrally placed healthy disk cup LE. Visual fields with Humphrey's field analyzer (HFA 24-2) showed early superior arcuate scotoma in RE. AS-OCT showed localized elevation of iris superiorly in RE.

Management: We made a diagnosis of secondary PG due

to IOL positioning. We performed an IOL exchange to prevent further pigment liberation, decrease the amount of synechial closure, and reduce the myopic shift. Two months later, his BCVA was 6/6 RE with -1.0 D Cyl at 140° and his IOP was 15 mmHg without therapy. Postoperative AS-OCT showed flattening of iris elevation.

P716 BILATERAL AND SIMULTANEOUS ANGLE-CLOSURE GLAUCOMA FOLLOWING ANESTHESIA

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A 62-year old female presented with complaints of defective vision both eyes for 10 days. She gave history of undergoing hysterectomy 10 days earlier under spinal anesthesia elsewhere. She was treated with the post op room with anti-glaucoma drops and topical steroids. On examination her visual acuity were 4/60 in right eye and 2/60 in left eye. Ocular examination showed corneal edema and dilated pupils in both eyes. Intra ocular pressures recorded were 28 mmHg in right eye and 30 mmHg in left eye. Laser iridotomies were tried in both eyes, but was not successful. Trabeculectomy was done in both eyes, in a gap of 4 days. Intra ocular pressures were 10 mmHg in Right eye and 8 mmHg in left eye after filtering surgeries. Fundus examination were normal in both eyes. She later developed cataract following filtering surgeries in both eyes, for which phacoemulsification with intraocular lens implantation was done.

P717 A MOST UNUSUAL ANGLE

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Mrs. M.H., a 60-year-old Caucasian, was referred for advanced chronic angle-closure glaucoma of the RE diagnosed a year previously. Two trabeculectomies had already been done. The LE had undergone no laser or incisional surgery. Her visual acuity was RE: +3.00 (-1.25 × 17°) 2/10 Add +3.00 P 10 and the LE +2.75 (-1.00 × 75°) 8/10 Add +3.00 P2. IOP was RE 18 mmHg on no medical treatment and LE 17 mmHg on a prostaglandin analog QHS and dorzolamide/timolol combination BID. CCT was RE 605 µ LE 592 µ. The RE had a relative afferent pupillary defect, a patient surgical iridectomy, and an intact filtering bleb. Gonioscopy of the RE showed PAS for over 270° completely covering the trabecular meshwork. Indentation gonioscopy of the LE showed significant relative pupillary block in all quadrants with the nasal angle completely closed by apposition. The nasal trabecular meshwork was lightly pigmented. The temporal angle, however, was open to the ciliary body band with no indentation necessary to easily observe the angle. There was heavily pigmented tissue resembling dense iris processes or uveal meshwork covering the angle structures. Question to the audience: This pigmented tissue is: normal iris processes? PAS inserted more posteriorly? On ocular fundus examination the RE had advanced glaucomatous optic atrophy, and the LE showed no cupping at all. The visual field RE had a centro-temporal island: the LE was entirely normal. Question to the audience: In light of the unusual gonioscopy findings LE, what is the next examination

to be performed? Anterior segment OCT? UBM? Something else? The UBM LE showed a closed nasal angle both in the dark and with illumination of the pupil. The temporal angle remained open at all times. The ciliary body was thicker on the temporal side with a ciliary body lesion measuring 6.35 x 1.05 mm. In summary, this patient has a pigmented ciliary body lesion (nevus versus melanoma) keeping the angle open by centripetal displacement of the iris root. Because of the small size and relative thinness of the lesion, the presumptive diagnosis is a nevus. The LE underwent a small laser PI nasally, and is also being followed at an ocular oncology center. (A case report is being prepared for publication). Iconography: Videogonioscopy of temporal and nasal angle LE. Video UBMs (in dark and light) of temporal and nasal angle LE. 24-2 visual fields.

P718 CLINICAL CASE PRESENTATION

R. Dhamankar

A 16 year old boy presented in May 2010, with a h/o pain, redness and diminished vision in the Left eye since the past few months. H/o injury to the LE with a fire cracker at the age of 1 year. H/o cataract surgery done with a posterior chamber intra ocular implant done at the age of 13 years.

A posterior capsular opacification developed and a Yag Capsulotomy was done 2 years later. Glaucoma was diagnosed in April 2008 and a trabeculectomy was done in Oct 2008. O/E: RE was WNL BCVA; 6/9 and N6. IOP was 20 mmHg. Fundus was normal, so was the perimetry. LE showed BCVA to be 6/18, N36, IOP was 36 mmHg. There was a flat bleb superiorly with a pseudophakia and an open PC. There were pigments on the anterior surface of the IOL. Pupil was RTL. Fundus showed a normal sized disc, with a c/d of 0.85 and thin NRR all round. The perimetry showed a generalised depression with a paracentral defect. A diagnosis of failed trabeculectomy was made and a RETRAB was done in MAY 2010. The immediate post-op period was uneventful, with vision improving to 6/12, N10, and IOPs at 14 mmHg. At 3 months the IOP started rising, and the bleb seemed to be failing, with episcleral fibrosis setting in. S/C Inj 5-FU was given in addition to topical Beta blockers. Four such Inj were given on alternate days. Ten days later, a nice diffuse superior bleb was seen with an IOP of 5 mmHg and Vision at 6/12, N10. Routine post-op tapering steroids were continued. Six weeks later the bleb was getting encysted with an IOP of 42 mmHg. A bleb needling was done, the bleb was formed and IOP came down to 4 mmHg. Patient's vision started dropping, BCVA 6/60 as patient developed choroidals with a maculopathy. Steroids were stepped up, choroids are settling, but no change in vision. IOP is rising. With every intervention the IOP is lower, how long to keep the steroids on? What is the cause of episcleral fibrosis setting in so quickly < 1 month How do you proceed?

P719 CLINICAL CASE PRESENTATION

R. Dhamankar

A 30-year old male patient was referred to us. He had been a k/c/o glaucoma since 13 years of age, with poor vision in the left eye. Was using G. Timolol 0.5% bd and G. Latanoprost HS in OU. Poor compliance O/E: OD showed a BCVA 6/9, IOP: 14 mmHg N6 Quiet AC, pupils reacting well to light and a fundus showing a normal sized disc with a c/d of 0.9

with a thin and pale NRR. OS: showed a BCVA: PL PR inaccurate, IOP of 36 mmHg, mid dilated fixed pupil, ciliary staphyloma seen superiorly and inferiorly and a fundus shows a glaucomatous optic neuropathy with a total pale cup. Perimetry: OD showed superior paracentral + superior arcuate defect, OD macular program also showed superior arcuate defect. OS Perimetry could not be done due to poor vision. As patient was non compliant with meds on follow up a trabeculectomy was suggested. In the interim period patient was lost to follow up and he came to us 6 weeks later with an IOP of 32 mmHg in the right eye. Trabeculectomy with MMC was done. The immediate post up was uneventful, with IOP in OD staying at 6 mmHg with a diffuse bleb. Later, the RE was doing fine, the non seeing eye was a problem. What next? He is on 2 drugs. Will you add more medications? Cyclodestructive procedures? Trabeculectomy? Advised: LE Ahmed Valve as he had a large ciliary staphyloma in the LE and was known to be non-compliant. OS Ahmed valve insertion done post-op VA OS PL+ PR inaccurate. IOP: 03 mmHg. OS Conjunctival bleb +AC Slightly shallow, Hyphaema + Pupil 4.0 mm dilated. Fundus: C:D::0.95. Bipolar notching. Early post-op was uneventful 2 months later: IOP OD 05 mmHg OS 28 mmHg OS – tube not seen in the anterior chamber. Impression – tube withdrawn from the AC and blocked. How to proceed? We decided to wait and watch, and started Alpha agonist e d in the LE. In subsequent follow-up the patient developed a conjunctival hole over the implant with Siedel's positivity. He was advised conjunctival suturing which he deferred initially. Conjunctival suturing was eventually done. Later, on a routine follow-up, the patient was found to have Extrusion of the Ahmed valve plate in the left eye. IOP (GAT) OD 04 mmHg OS 02 mmHg. The valve had extruded out completely with shallow-flat anterior chamber. NOW WHAT? Pressure bandage was applied and removed after 4-5 hours after which the anterior chamber was relatively well formed OS removal of the Ahmed valve and conjunctival suturing was done. Post-op recovery was uneventful with normal to low IOP and Siedel's negative. When he last presented to us VA with PG OD 6/12p; OS PL+ IOP: 7 and 24 mmHg, OD. Trabeculectomy bleb+, OS – Ciliary+Intercalary staphyloma with temporal conjunctival scarring. Fundus OD C:D::0.95 with no inferior rim, OS Glaucomatous optic atrophy. Patient was asked to continue G. Combination Therapy OS and follow-up in 2 months. All pictures are well documented.

P720 CLINICAL CASE PRESENTATION: I HAVE A SMALL EYE AND A HOLE IN MY EYE AND I CAN SEE LESS

R. Dhamankar

A 11-year-old male patient presented with C/O decreased vision wearing a pair of glasses. No H/O trauma. S/A: (RE) -2.50 DS /-2.0 DC x 60 6/24, N8. (LE) +10.0 DS/+1.0 DC x 35 FC 1 ½ meters, N36. IOP: (RE) 32 mmHg, (LE) 33 mmHg. **On Examination:** Hypertelorism + built small for age. (RE)- Microcornea, Corneal diameter vertical and horizontal: 9 mm. AC-irregular, gonioscopy showed closed angles, atypical iris coloboma. Anterior subcapsular cataractous lens. Fundus: normal-sized disc, CDR 0.5, HNRR, no chorioretinal coloboma seen. (LE): cornea normal, vertical and horizontal diameter: 12 mm, iris typical iris coloboma, gonioscopy-pigmented TM visualized temporally and inferiorly. Lens-aphakia (absorbed lens). Fundus: normal-sized disc, CDR 0.5, HNRR, no choroidal coloboma seen.

Investigations: Perimetry done in the RE shows normal VF and perimetry cannot be done in the LE due to poor VA. OCT done in BE shows RNFL to be WNL.

How to proceed? Systemic examination does not yield anything positive. Dentition normal, hearing normal, no skeletal deformities, no cardiac involvement, no umbilical abnormality, no renal problem. The poor vision in the LE is probably due to amblyopia. Poor vision in the RE? Is it only cataract? Cause of cataract? IOP? Treat medically?

Started medical treatment for the IOP, partial response, IOPs came down to 24 mmHg with combination therapy, but patient is very uncompliant.

Cataract in the RE, to be operated? 50% chances of this child developing glaucoma in the future? Laser is ruled out, as the angle is closed.

Impression? Iridogoniodysgenesis? Heredity? Genetic work up?

P721 CASE REPORT FOR GRAND ROUND: ANIRIDIA WITH SUBLUXATED CATARACTOUS LENS WITH GLAUCOMA

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A seven-year-old boy presented to us with gradual progressive deterioration of vision for last two years. On examination his best corrected visual acuity was finger counting at 1/2 meter in right eye, and finger counting at 1 m in left eye from aphakic area. He was on therapy with dorzolamide and timolol 0.5% in both eyes. Applanation intraocular pressure was 44 mmHg in RE and 42 mmHg in LE. His horizontal corneal diameters were 11.5 mm right eye (RE) and 11.5 mm left eye (LE), with pachymetry of 650 µm in both eyes. His lens was cataractous and superiorly subluxated in both eyes. Fundus evaluation revealed a vertical cup to disc diameter ratio was 0.9:1 RE and 0.8:1 LE, with foveal hypoplasia in both eyes. He was diagnosed as both eyes aniridia with subluxated lens with glaucoma. The case will be put to the panel for surgical options. We performed both eye pars plana lensectomy with AC maintainer with implantation of Ahmed glaucoma valve with pars plana clip.

P722 SWAN SYNDROME – POST-TRABECULECTOMY

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Background: Focal vascularization from an ingrowth of episcleral vessels at the cataract wound site, resulting in recurrent intraocular bleeding, has been termed Swan syndrome. It has been reported following intracapsular cataract extraction, extracapsular cataract extraction (including clear corneal incisions), iridocyclectomy, and glaucoma filtering procedures.

Case report: A 32-year-old, one-eyed Asian-Indian male, with history of high myopia, presented with uncontrolled primary open-angle glaucoma in the left eye (February 2007).

Past history: His right eye had been enucleated in his late teens after phthisis bulbi following unsuccessful retinal detachment surgery. He also had a past history of prophylactic cryo to retinal break in the left eye in 2000. He also had a uneventful phacoemulsification with IOL (hydrophobic

acrylic) implantation OS for a posterior subcapsular cataract in 2006. He was a known steroid responder.

Systemic History: He had no systemic illnesses.

Meds: Tab Acetazolamide 250 mg BD, Timolol 0.5% bd, Latanoprost 0.005% od, Brimonidine 0.15% bd

On examination: OS (Feb 2007) – BCVA – 6/9, N 6. A/S – pseudophakic, one posterior synechia to ant. capsule. Pupil irregular, briskly reactive. Gonio – open angle, IOP – 38 mmHg (with MMT). Disc – myopic-0.4 c.d., peripheral retinal laser scars, lattice degeneration. Visual fields – generalized depression of retinal sensitivity. March 2007: he underwent uneventful trabeculectomy with Mitomycin C with releasable sutures. Post-trab IOPs were well controlled 10-12 mmHg, without medications, sutures cut at 2 months after surgery. August/September 2007: Two episodes of mild anterior uveitis which responded to topical steroids; uveitis workup- normal; DD – intermittent low grade inflammation; anterior non-granulomatous uveitis of unknown etiology. Mild low-grade endophthalmitis s/p trab. AC tap- positive for P acnes genome. Intravitreal Vancomycin was given. One episode of ant. uveitis in February and May 2008, resolved with Dexamethasone e/d. Repeat episodes in March 2009 and June 2009. August 2009: patient presented with c/o blurred vision OS since morning. No h/o antecedent trauma. O/E-A/S – small hyphema, which resolved uneventfully in a few days. BCVA, A/S, disc, retina and IOP were maintained.

Gonioscopy: Showed a pinkish blush on the internal ostium, neovascularisation and the vessels were seen to actively bleed with pressure from the Goniolens. Rest of the angle was open with moderate pigmentation. A diagnosis of SWAN syndrome was made. Vascularisation of the internal ostium was probably causing repeated small hyphemas, which would probably set up a reactionary inflammation, which were the episodes of repeated mild ant uveitis seen all along. Management: Diode laser ablation, using high magnification goniolens, slit lamp delivery September 2009. However, we noted one recurrence of microhyphema episode in December 2009, and one more recurrence in May 2010. The new vessels were seen to have recurred on the internal ostium. The patient was given intravitreal Bevacizumab 2.5 mg in 0.1 ml, with Sub conj injection at trab site. The patient has had no recurrences till date (February 2011), BCVA, IOP, retinal status stable.

SWAN syndrome is rare, but needs to be kept in mind as a DD for recurrent inflammation with hyphema after anterior segment surgeries, with a scleral approach. Anti-VEGF drugs can be effectively used in the management of this condition.

P723 CASE PRESENTATION

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Case Description: A 31 years old female with history of rheumatic heart disease and Mitral valve replacement with a mechanical prosthetic valve on anticoagulants for life.

History of wearing contact lenses, repeated use of steroid drops, increased IOP that decreased by the use of anti-glaucoma medications. Best corrected visual acuity 6/18 in both eyes, IOP 16 mmHg bilaterally on medications, normal anterior segment and bilateral pale optic disc with bilateral contracted fields. Electrophysiological testing showed rod/con dystrophy consistent with the diagnosis of Retinitis Pigmentosa. The patient is poorly compliant to medical treatment and follow-up visits.

Diagnosis: Steroid-induced glaucoma in a case of retinitis pigmentosa on anticoagulant therapy for Mitral valve replacement

Management Problems: 1. What prognosis is expected in this case? 2. If Medical treatment only were decided, what would be the safest drugs to be used? 3. If surgery is decided which type is recommended to be safest for the retinal condition? 4. If surgery is recommended should anti-coagulant therapy 'warfarine' be stopped and bridged with Heparin in the peri-operative period? 5. If surgery is recommended should the patient receive prophylactic antibiotics for prevention of bacterial endocarditis?

P724 TRAUMATIC SUBLUXATED LENS WITH SECONDARY GLAUCOMA: A CHALLENGING CASE TO MANAGE

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Background: To report our experience in managing a challenging case of trauma related glaucoma whereby multiple surgeries performed resulted in successful IOP control.

Method: Case report.

Results: A 25-year old Malay man alleged a fire cracker injury to his right eye one month prior to presentation was referred for uncontrolled intraocular pressure (IOP). He sustained right corneal abrasion, traumatic mydriasis, subluxated lens and secondary glaucoma. Right intracapsular cataract extraction (ICCE) and anterior vitrectomy were performed by referring ophthalmologist. Ocular examination revealed right aphakia with best corrected vision of 6/30 and IOP of 39 mmHg on maximum antiglaucoma medication. There was presence of minimal vitreous strands in the anterior chamber at 9 to 10 o'clock position and cup to disc ratio of 0.7. He underwent Right Baerveldt implantation and the silicone tube was placed at 12 o'clock position. However, post Baerveldt implantation the IOP increased to 50 mmHg due to vitreous incarceration in the tube. Antiglaucoma medications were stepped up and at Day 9 post Baerveldt implantation, right pars plana vitrectomy was performed to clear the vitreous. Initially the IOP was low but elevated again to 55 mmHg at Day 4 post vitrectomy. At Day 21 post Baerveldt implantation, the silicone tube stent was removed and subsequently the IOP normalized without antiglaucoma treatment. No hypotony noted. Three months postoperatively the best corrected visual acuity was 6/18.

Conclusion: Multiple surgeries in trauma cases are inevitable. Baerveldt implantation in aphakic eyes can be complicated with presence of vitreous in anterior chamber. Adequate vitrectomy is warranted to prevent vitreous incarceration in glaucoma implant tubes.

P725 DIFFERENT STROKES FOR DIFFERENT FOLKS

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Case: A 38 year old lady with hypermetropia, in the first trimester of pregnancy presented with a painful, red left eye. Acute primary angle closure (PAC) was diagnosed in the left eye. No response was obtained with supine posture, firm pressure with gonioslens and pilocarpine drops following punctal occlusion. Diffuse corneal edema precluded the use

of argon laser iridoplasty. She underwent controlled anterior chamber paracentesis (ACP) on the slit lamp with aseptic precautions. The IOP reduced from 48 mmHg to 16 mmHg and YAG iridotomy was possible within 3 hours with clearing of corneal edema. The patient remains under review following an otherwise uneventful pregnancy with a healthy baby born at full term.

Discussion: There is limited experience in management of glaucoma in pregnancy with lack of safety data on glaucoma medications especially systemic therapy. PAC has been described during pregnancy in only two patients, both during labor, induced by the associated sympathetic overdrive and a possible effect of labor inducing drug (Ritodrine, a selective β_2 adrenergic agonist). To our knowledge, this is the first reported case of PAC in early pregnancy. Evidence based systematic approach to PAC is discussed especially in a young patient.

Message/Lesson: The case is an example of good practice that led to risk of glaucoma medication to the fetus being eliminated with a rapid resolution of the PAC episode. It reminds us of the role of alternative management strategies for PAC like controlled ACP in selected cases where systemic and/ topical therapies are unsuitable or inadequate.

P726 IRIDOCORNEAL ENDOTHELIAL SYNDROME (ICE)

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A 41-year-old woman was presented in October 2008 to our clinic with elevated IOL. The patient's past medical history included disseminated sclerosis with intermittent immunosuppressive corticosteroid therapy from 1999. She was examined by the ophthalmologists for repeated headache. On examination, the patient's BCVA was 6/24 OD and 6/6 OS. Her IOP measured 28 mmHg OD and 15 mmHg OS with Goldmann applanation tonometry. Central corneal thickness was 545 μ m OD and 550 μ m OS. The slit-lamp examination of the right eye revealed abnormalities of the anterior chamber angle, and iris. Gonioscopy showed peripheral anterior synechiae which extend beyond Schwalbe's line and small degrees of corectopia directed toward the quadrant with the most prominent area of peripheral anterior synechia. The right optic nerve had advanced glaucomatous damage with a loss of the rim and pallor. The left eye examination was normal. The patient's examination suggested a diagnosis of iridocorneal endothelial syndrome (ICE) with glaucoma and the patient initially was treated by combined therapy ICA and betablockers – Cosopt. On July 2009 – 8 months later, her IOP elevated on 47 mmHg and the trabeculectomy (TE) was performed, 2 months after surgery the needling was performed for the scarring of the bleb. We continued local treatment with Cosopt. On January 2010 the IOP increased on 30 mmHg and the surgery was necessary to repeat, TE with Mitomycin C was done. Despite undergoing surgeries on the right eye the long-term prognosis of IOP was poor. On July 2010 Ahmed glaucoma valve was done. We did not observe any complications during the procedure but the late failure after the shunt re-operation occur. What would be the next step?

P728 CLINICAL CASE PRESENTATION

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A 41-year-old woman presented with a history of left eye pain and blurred vision for 2 days. Present illness: Three years ago, she was diagnosed with cataract, primary open-angle glaucoma and mild non-proliferative diabetic retinopathy in both eyes. Her visual acuity was 20/200 and Fc 3 ft. She was currently treated with 0.5% timolol to BE bid and switch to brimonidine/timolol fixed combination.

Six months ago, after the fasting blood sugar was controlled, she underwent phacoemulsification with IOL, RE. After that, proliferative diabetic retinopathy of the right eye was found. Panretinal photocoagulation of the right eye was performed. Five months ago, she underwent phacoemulsification with IOL, LE. Two months later, she presented with terrible eye pain, LE with nausea and vomiting. Left eye examination revealed iridocorneal touch, LE with IOP of 55 mmHg. She was treated with anterior chamber paracentesis and 100% Glycerin stat, acetazolamide 1 tab oral q 6 hr, brimonidine/timolol fixed combination, BE bid, brinzolamide, LE bid, 1% Prednisolone acetate, LE q 1 hr, and moxifloxacin, LE qid. After the IOP decreased to 14 mmHg, peripheral iridotomy, LE at 2 o'clock was performed. At that time her visual acuity was 20/70 and 20/100 for right and left eyes with brimonidine/timolol fixed combination, BE bid, and brinzolamide, LE bid. Two months ago, she presented at the emergency department with left eye pain. Her visual acuity was Fc 1 ft. and IOP of 60 mmHg. The PI was not patent with shallow peripheral anterior chamber and corneal microcystic edema. After IOP was controlled, the second PI was done at 10 o'clock. The IOP decreased to 14 mmHg, LE. She still treated with brimonidine/timolol fixed combination, BE bid, Brinzolamide, LE bid.

2 days ago, she started to have left eye pain again. Visual acuity was Fc 2 ft. with IOP of 70 mmHg. Left eye examinations revealed corneal microcystic edema with ciliary injection, small 1 patent PI and 1 occluded PI with iris bombe and rubeosis iridis around PI.

Note: This history and physical examination will be presented with anterior segment photographs and ultrasound bio-microscope printout.

P729 ABSTRACT WITHDRAWN

P730 CASE REPORT: AN UNUSUAL CAUSE OF POST-OPERATIVE ATHALAMIA

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A 56-years-old male with uncontrolled advanced chronic angle-closure glaucoma underwent uneventful phacotrabeculectomy with implantation of hydrophobic single piece lens in the lens capsule (Acri.Smart 46LC, Zeiss). At the end of the procedure a small amount of viscoelastic solution (Viscoat®) was left in the anterior chamber in order to prevent postoperative athalamia. A week later, VA was counting fingers and the examination showed: shallow anterior chamber, IOP of 4 mmHg, negative seidel test and no choroidal detachment. Refraction was -3.50 sph -0.50 cil 150. Carefully examination under complete pupillary dilatation showed an optically clear liquid between the posterior surface of the IOL and the posterior capsular membrane, the capsular bag was distended: iris and IOL moved forward while posterior cap-

sular membrane backwards. Almost immediately after posterior capsulotomy with Nd:YAG laser was performed, the athalamia was completely solved

Discussion: Capsular Bag Distension Syndrome (CBSD) is an uncommon and rarely recognized cause of postoperative athalamia after combined surgery in glaucoma. This syndrome occurs after remaining viscoelastic solution or cortex is trapped between the IOL and the posterior lens capsule. The rhexis diameter must be smaller than the optic diameter of the lens. Remaining viscoelastic or cortex in the lens capsule makes an osmotic gradient across the posterior lens capsule that would cause liquid accumulation in the capsular bag. As shallow anterior chamber and hypotony are very common features after glaucoma surgery, this syndrome is frequently misdiagnosed. In many cases, CBSDs have been described even years after the phacoemulsification. Carefully examination is mandatory, especially when it is done without pupil dilatation and remaining viscoelastic or cortex is suspected to be inside the lens capsule. Nd:YAG laser posterior capsulotomy is a simple procedure that solves almost immediately this syndrome. The fluid material inside the lens capsule is released through the posterior capsulotomy to the vitreous cavity while the iris and the lens move back to its correct position.

P731 CLINICAL CASE PRESENTATION

Neha Chaturvedi

A 14 old girl child presented to the out-patient department of Dr Rajendra Prasad Centre For Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi with the chief complaints of progressive enlargement of the both eyeballs noticed since birth by her parents. The enlargement of the eyeballs was associated with poor vision, watering and photophobia. The parents did not seek treatment for the child at an earlier age due to lack of finances. Her visual acuity was perception of light in both eyes with accurate projection of rays in all four quadrants. The general physical examination and the systemic examination did not reveal any abnormality. Corneal diameters measured approximately 23 mm x 22 mm OD and 24 mm x 23 mm on horizontal and vertical axis. The cornea revealed stromal haze with haab striae and superficial vascularisation in all quadrants with an enlarged limbus. Gonioscopy was not possible but the angle was visible directly with a torch light examination revealing an open angle and anterior insertion of the iris. The pupils were fixed dilated and not reacting to light. Tonopen reading of both eyes measured 42 mmHg OD and 46 mmHg OS. The fundus examination on indirect ophthalmoscopy revealed severe chorioretinal degeneration with near total glaucomatous atrophy in both eyes. The axial length was 38.15 mm OD and 38.12 mm OS. The child was started on oral acetazolamide, a fixed dose timolol and brimonidine topical combination and latanoprost. The surgical management of this case is very challenging and we want the experts to discuss the management options for such cases.

P732 CLINICAL CASE

A. Oliveira

A male patient, 35 years old, Brazilian, Caucasian, with glaucoma history in his family, had all kind of glaucoma exams within normal limits, including normal intra-ocular pressure. After 3 months, he came back to the office and had every-

thing changed. His cup/disc ratio was 0.8 on both eyes and a trabeculectomy was performed.

P733 CLINICAL CASE

A. Oliveira

GFO, female, 30 years old, Brazilian, Caucasian, enter the office and told that she was in pain for about one week on both eyes after started a treatment for uveitis. She had intraocular hypertension (42 mmHg), conjunctival hyperaemia, corneal edema, anterior chamber cells, mydriasis, visual acuity reduced. She stopped all medicines in use. The doctor treated her for hypertension and she came back in two days: without pain, with better visual acuity and intra-ocular pressure, her fundus exam without alteration (retina and optical nerve). An iridectomy by laser was done on both eyes but after a few days appeared to be not working. After a week another iridectomy was done, but still not worked. The patient returned to the office and told the physician that she has pain and had blurry vision on the right eye in the afternoon. Another medicine was prescribed. At the last visit, the IOP was good, as well as her vision, but she referred to dry eye sensation.

P734 CLINICAL CASE PRESENTATION

C. Pallás¹

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A 28-year-old woman, with a history of left corneal perforation from a contact lens-related pseudomonas keratitis, was treated elsewhere with antibiotics and a conjunctival flap. She presented three months after the initial episode, with hand movements vision, a conjunctival flap covering three quarters of the cornea superiorly, stromal edema inferiorly, new vessels and cataract. The eye was quiet. It was not possible to applanate the cornea, but intraocular pressure (IOP) by digital measurement was substantially elevated. The fundus and optic nerve could not be visualized; ultrasound confirmed an attached retina. There was synechial closure of the superior half of the angle. The IOP was uncontrolled despite maximal therapy, necessitating an Ahmed valve implant in the superotemporal quadrant. As the patient was phakic, the tube was placed in the anterior chamber (AC). This preceded a penetrating keratoplasty following which her visual acuity (VA) improved to 0.3 – 0.4 and IOP was relatively controlled (23 mmHg with 3 agents). Her cataract worsened, VA decreasing to 0.1, and was removed. The IOP again reached unacceptable levels. Numerous bleb needlings were carried out with injections of 5-FU, and the tube patency confirmed through the AC. The elevated IOP persisted until a secondary implant was added, this time in the superonasal quadrant with a ciliary sulcus tube.

Two years later, the IOP is 16 mmHg on two medications and VA is 0.8. The patient is followed up every 4-6 months with stereoscopic disc photos, visual fields and endothelial cell counts.

P735 TRIPLE SURGERY COMBINING PARS PLANA VITRECTOMY, AHMED VALVE IMPLANTATION AND BOSTON TYPE 1 KERATOPROSTHESIS TO TREAT COMPLICATED CONGENITAL GLAUCOMA

C. Pallás¹

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A 35-year-old male arrived at our institute complaining of intense discomfort and loss of vision in his only, right eye. He had been diagnosed with bilateral congenital glaucoma within a week of birth and had had a left enucleation aged 10 for a painful, blind eye with uncontrolled hypertension, despite multiple surgical procedures. In his remaining eye, goniotomy, trabeculectomy, cataract surgery without IOL implantation and 3 penetrating keratoplasties had been performed elsewhere. Vision 2 years previously had been hand movements according to his medical notes. He was using Combigan and Lumigan drops.

On examination, we recorded light perception without projection. There was bullous epithelial and diffuse stromal corneal oedema, aphakia with cortical and capsular remnants but no evidence of vitreous in the anterior chamber (Visante anterior OCT proved inconclusive due to media opacity). Goldmann tonometry gave a reading of 22mmHg, against a pachymetry of 820 microns. The iridocorneal angle had multiple, diffuse, broad peripheral anterior synechiae, and fundoscopy showed a flat retina, with almost total glaucomatous neuropathy.

A provisional Eckardt keratoprosthesis was performed, combined with a 23 gauge pars plana vitrectomy and Ahmed valve implantation (tube in the posterior segment), and a definitive Boston type 1 keratoprosthesis (video).

6 months after his triple surgery, vision is HM and he tolerates a therapeutic contact lens well. The keratoprosthesis shows no sign of breakdown or endophthalmitis (on long-term steroids, vancomycin and a fluoroquinolone antibiotic), and the tube appears well-positioned and patent. The retina remains flat, and stereoscopic viewing suggests a stable optic nerve. Digitally-measured IOP is between 10 and 20 mmHg, on no topical treatment, and the patient no longer feels any discomfort. Follow-up is 3-monthly.

P736 PARRY ROMBERG SYNDROME: PROGRESSIVE HEMIFACIAL ATROPHY ASSOCIATED WITH SCLERAL MELT: MANAGEMENT OVER 10 YEARS

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We present a unique case and share extremely challenging clinical management issues over 10 years.

A 60 year old man presented with irritation of the right eye a sclera melt causing limbal bleb and hypotony. He was diagnosed to have progressive hemifacial atrophy (Parry Romberg Syndrome) for which he underwent facial reconstructive plastic surgery. A detailed clinical investigation was done to rule out other causes of sclera melt. He was observed for 8 years for signs of hypotony maculopathy. He developed reduced vision and hypotony maculopathy after 8 years. We performed bleb repair with donor sclera graft. He developed extremely high intraocular pressure rise postoperatively requiring inpatient treatment with intravenous acetazolamide and mannitol. He had to carry out cyclodiode ablation of ciliary body to control IOP after 72 hours. This resulted in hypotony, cataract and reduced vision.

Parry Romberg syndrome is a rare disorder of unknown etiology. Scleral melt should be recognized as an association of this syndrome. Opinion of international expert will be highly valuable on how would they have approached this case and on specific issue of how to surgically close these sclera melt.

P737 CASE REPORT: GLAUCOMA FOLLOWING PHACO-EMULSIFICATION AND POSTERIOR VITRECTOMY IN AN UVEITIC EYE

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A 56-year-old man was clinically admitted at the glaucoma department complaining of low visual acuity and mild discomfort on the left eye. He was first admitted at the ER 1 year earlier complaining of blurred vision, redness and photophobia on the right eye. He was diagnosed and treated as ocular toxoplasmosis and treated accordingly. Later he developed cataract and vitreous opacities. Three months prior to his admission he was submitted to phacoemulsification and posterior vitrectomy in his right eye. Best-corrected visual acuity (BCVA) was hand movements on the right eye and 20/20 on the left eye. Anterior segment examination of the right eye revealed: anterior bowing of the peripheral iris, and a complete pupillary block due to synechia. IOP OD: 28 mmHg. He was then submitted to laser iridectomy and topical medication. After the laser, biomicroscopy showed a flattened iris. IOP 22 mmHg. After 15 days IOP was 32 mmHg and he was still complaining. Gonioscopy showed a closed angle 360 degrees. After a long discussion we programmed a goniosynechiolysis. The final IOP was 12 mmHg without topical medication.

P738 RECURRENCE OF MALIGNANT GLAUCOMA POST VITRECTOMY SURGERY

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Background: Malignant glaucoma continues to present a difficult clinical challenge to the ophthalmologist as regards to pathogenic mechanism, treatment and predictors for resolution.

Methods: A 44-year-old lady, a known case of angle-closure glaucoma presented status post failed repeat trabeculectomy with decreased vision in the left eye. On examination, her IOP was 12 and 32 mmHg in the right and left eye, respectively with shallow axial and peripheral anterior chamber and patent peripheral iridotomy, absent osteum and pseudophakia in the left eye. A hyaloidotomy was done through the surgical PI site following which she underwent uneventful Ahmed glaucoma valve implantation for uncontrolled IOP. After initial control of IOP for 1 month, she developed recurrent shallowing of the anterior chamber with raised IOP (Fig. 1). She underwent Pars plana vitrectomy with inferior surgical peripheral PI after which her IOP still remained high, though the anterior chamber formed well. On examination, a thin inflammatory membrane was visible through the PI which was broken by hyaloidotomy performed through the PI site (Fig. 2a and 2b).

Results: The final IOP in the left eye on brimonidine 0.2%

and timolol maleate 0.5% remained stable at 18 mmHg with well formed anterior chamber till last follow up of 2.5 years.

Conclusions: While diagnosis and treatment of malignant glaucoma is still controversial, a high index of suspicion is required for chronic angle closure patient with increased IOP and patent peripheral iridotomy. There may be a recurrence of the condition, which needs to be detected and managed appropriately.

P739 ABSTRACT WITHDRAWN

P740 VERNAL KERATOCONJUNCTIVITIS WITH STEROID INDUCED GLAUCOMA (POST TRABECULECTOMY + MMC IN BOTH EYES)

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Case Description: A 7-year-old boy came to our hospital 10 months ago with a chief complaint of blurred vision, redness and itching in both eyes. The redness and itching had started 3 years ago and he had used a topical steroid regularly without ophthalmologist's control during the last year. Since 3 months, he suffered of blurred vision in both eyes. There is no history of other allergies.

Examination: We revealed the visual acuity was counting finger at 1 meter in both eyes. The eye position was orthotropia with no limitation of the eye movement on both eyes. The IOPs (non-contact tonometry) were 45.8 and 42.4 mmHg in the right and left eyes respectively. In slit-lamp examination, we found mild papillary reaction in superior tarsal conjunctiva, limbal papillary reaction and bulbar conjunctival injection in both eyes. In cornea, punctate epithelial keratitis was found in both eyes with Shield's ulcer in the right eye. In posterior segment examination we revealed c/d ratio 0.8-0.9 in both eyes.

Therapy: Fluorometholone ed; Lodoxamine 0.1% ed; Artificial tears ed; Timolol maleate ed; Acetazolamide eye drops and oral; and the patient underwent filtering surgery (trabeculectomy + MMC) in both eyes.

Two months after surgery, the IOP in the left eye raised and the IOP in the left eye could not be controlled with 2 hypotensive medication until now (6 months).

Present eye examination: Visual acuity: counting finger at one meter in both eyes.

IOPs (non-contact tonometry): 8 mmHg in the right eye and 46.7 mmHg in the left eye.

In anterior segment examination, we revealed active vernal keratoconjunctivitis in both eyes and posterior subcapsular cataract in the left eye. The plan of patient assessment for the left eye: 1. Trabeculectomy + MMC + lens extraction + intraocular lens OR 2. Trabeculectomy + MMC without lens extraction OR 3. Trabeculectomy with glaucoma drainage implant

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