WORLD GLAUCOMA CONGRESS

Singapore, July 18-21, 2007

ABSTRACTS BOOK

Organized by

The Association of International Glaucoma Societies

The Global Glaucoma Network

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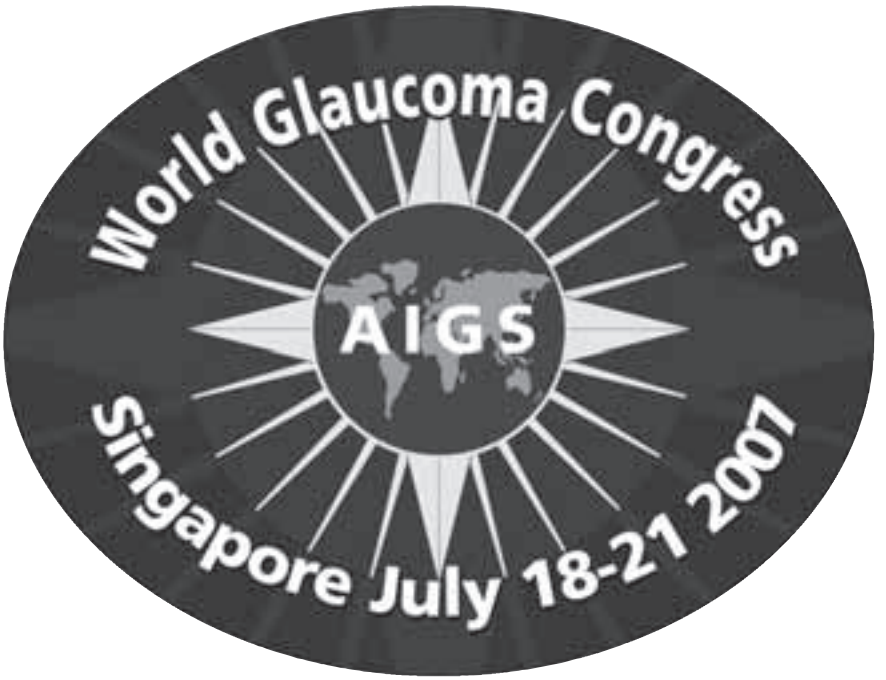

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CONTENTS

DIDACTIC SESSIONS

Thursday, July 19, 2007

8.30-9.15 a.m.

D1-01 GLAUCOMA'S IMPACT ON QUALITY OF LIFE

A. Coleman
Los Angeles, CA, USA

Objective: To discuss the impact of glaucomatous optic nerve damage on patients' quality of life.
Main Message: Prior to blindness, glaucomatous optic nerve damage and visual field loss may adversely affect a patient's quality of life. As a patient's visual field loss worsens, their quality of life worsens. Patients with glaucoma are at increased risk for falls and fractures.
Conclusions: 1. Patients with glaucoma may have decreased quality of life, even if they are not blind; 2. Quality of life worsens as visual field loss increases.

D1-02 SCREENING FOR ANGLE-CLOSURE IN ASIA

N. Congdon
Hong Kong, P.R. China

Objective: To discuss the basic principles for screening for angle-closure in Asia, including appropriate venues, requirements, approaches and limitations (warning: heavy emphasis on the latter!)
Main Message: A. Facts about angle closure (AC) and angle-closure glaucoma (ACG): 1. Though open-angle glaucoma (OAG) is actually more prevalent in most Asian populations, including Chinese, patients presenting with ACG are some three times more likely to be blind; 2.As a result of moe rapidly increasing prevalence of myopia and pseudophakia in urban Asia, ACG may become an increasingly rural disease; 3. We do not currently have the data to justify population screening and laser treatment for AC/ACG. It is known that laser treatment late in the disease process is usually not sufficient, but we do not know how effective earlier intervention can be in preventing progression to more severe disease. We also do not know what the side-effect profile of large-scale laser treatment would be. B. Facts about the healthcare systems in rural India and China: 1. Rural access to eyecare is extremely poor in China, but improving in India; 2. Most rural eyecare in Asia is aimed at screening and providing surgery for cataract. Only a relatively small proportion of patients presenting for screening actuaaly have or need cataract surgery. The remaining persons constitute a large cohort in the age range at maximum risk for AC/ACG. 3. The equipment, training and practice habits necesary to screen effectively for AC/ACG are effectively non-existent in rural India and China.
Conclusions: 1. Given the current sate of knowledge with regards to screening and treatment efficacy and risk, a clinic-based approach, focused on screening patients who present for routine eye care and cataract evaluation, is likely to be the most cost-effctive strategy to screen for AC/ACG in Asia; 2. Implementation of this strategy, particularly in rural areas where the prevalence of untreated disease is likey to remain high, is highly dependent on fundamental improvements in the quality of ophthalmology training in India and China as regards gonioscopy and examination of the optic nerve. 3. To achieve such substantial changes in the quality of residency training will require promulgation of national standards for residency curricular content and clinical competence.

D1-03 SCREENING STRATEGIES FOR OPEN-ANGLE GLAUCOMA

R. Varma
Los Angeles, CA, USA

Objective: To present a review of screening approaches to the detection of one of the leading causes of irreversible blindness.
Main Message: Glaucoma is a group of diseases associated with characteristic optic nerve and visual field damage. Given that glaucomatous damage is irreversible and may be associated with impacting a persons quality of life, early intervention if successful may retard or prevent this. Therefore, it would be important to screen for and intervene early in the course of glaucoma. However, most methods of screening are less than ideal and the currently available strategies such a visual field testing and optic nerve imaging are cumbersome and not cost effective. Therefore, screening for glaucoma needs to be performed in the context of screening for other blinding eye diseases (cataract, diabetic retinopathy and macular degeneration) in addition to glaucoma so that there is a higher yield and hence greater cost effectiveness. Such a screening would involve an assessment of visual acuity, imaging of the optic disc and macula and a visual field test.
Conclusion: 1. Glaucoma screening while desirable is not currently cost effective due to the low yield; 2. Screening for glaucoma in the context of screening for other blinding eye diseases will make screening more cost effective and provide a greater yield.

D1-04 WORLDWIDE EPIDEMIOLOGY IN GLAUCOMA

H. Quigley
Baltimore, MD, USA

Objective: To present data on how many persons of what ethnicities have open angle and angle closure glaucoma worldwide.
Main Message: Glaucoma means optic nerve damage and the modern definition as proposed by the ISGEO includes specific criteria for disc and automated field damage that must be satisfied to compare data across studies and in clinical practice. Intraocular pressure (IOP) level is no longer a defining criterion for open angle glaucoma (OAG). Since there are few clinical distinctions between those with OAG at lower and higher IOP, the term normal tension or low tension glaucoma is outmoded and counterproductive. The definitions of angle closure (AC) and angle closure glaucoma (ACG) depend upon the presence of specific gonioscopic findings, and the presence of either adverse consequences (elevated IOP, angle synechiae, or past acute attack). ACG is defined as those with appositionally closed angles and optic nerve damage as defined above. Data from popula-

tion-based studies indicate that there are 60 million persons with glaucoma worldwide, 46 million with OAG and 16 million with angle closure glaucoma (ACG). The prevalence of both forms increases with age and differs in prevalence and incidence in the world's ethnicities, with highest age-specific prevalence of OAG in Africans and of ACG in Chinese persons. ACG blinds proportionately more of those with it than does OAG, so among the 8.4 million estimated blind from glaucoma, half have ACG.
Conclusions: 1. Standard definitions must be used in OAG and ACG to allow comparisons across research studies and to produce clinical care that is optimal; 2. OAG and ACG affects those of different ethnicities differentially; 3. Public health measures may be most effective in attacking ACG.

D1-05 HOW EARLY IN GLAUCOMA IS QUALITY OF LIFE AFFECTED?
A. Viswanathan
London, UK

Objective: To examine the commonly held belief that glaucoma is asymptomatic until the end stage of the disease.
Main Message: Several independent research groups worldwide have found that Quality of Life is significantly affected even in mild to moderate glaucoma. This damage is usually reported not in the visual domain but in other areas such as mobility, so it may not be appreciated by clinicians if they are purely focused on vision.
Conclusion: In glaucoma Quality of Life is affected earlier than is generally supposed.

9.15-10.00 a.m.

D2-01 PATHOPHYSIOLOGY OF ANGLE-CLOSURE GLAUCOMA
D. Lam
Hongkong

Objective: To review the basic pathophysiology of angle-closure glaucoma (ACG).
Main message: Angle-closure glaucoma (ACG) is often subdivided into acute and chronic subtypes. Acute angle-closure (AAC) is a form of symptomatic ocular hypertension secondary to a sudden appositional occlusion of the drainage angle by peripheral iris tissue. AAC, if left untreated, frequently leads to irreversible optic nerve damage, and a significant proportion of affected eyes may progress to chronic angle-closure glaucoma (CACG). CACG, apart from being a sequel of acute angle-closure, may also arise *de novo*. ACG is also subdivided into primary and secondary subtypes. ACG is primary if it has arisen independently of any other pre-existing pathological eye conditions. If it is the direct consequence of another pre-existing eye disease, it is regarded as secondary. Angle-closure is usually the result of apposition or adhesion of the peripheral iris to the surface of the pigmented trabeculum meshwork, and thus blocking aqueous access to the filtering trabeculum. Blockage of the trabeculum at any position can be complete or partial. It can also be intermittent (appositional) or permanent (synechial). When a sufficient proportion of the angle is closed, the IOP is bound to rise in an eye with normal, or near normal, aqueous production facility. It appears that angle-closure causes optic nerve damage through raising the intraocular pressure. The major challenge to ophthalmologists is to arrest the course of this disease, in order to prevent permanent angle-closure and subsequent glaucomatous optic neuropathy.

D2-02 PATHOPHYSIOLOGY OF POAG
E. Tamm
Regensburg, Germany

Objective: To discuss the pathogenetic mechanisms that lead to elevated intraocular pressure (IOP), the most critical risk factor for POAG.
Main Message: IOP is generated in the trabecular meshwork (TM) which provides resistance to aqueous humor (AH) outflow. The resistance is increased in POAG, and changes in the quality and amount of the extracellular matrix (ECM) in the juxtacanalicular region (JCT) of the TM appear to be causatively involved. The ECM changes are very likely under control of transforming growth factor-β2 (TGF-β2), which is found at high concentrations in the AH of patients with POAG. TGF-β signaling mediates a pathological increase in ECM deposition. Additional factors are thrombospondin-1, which activates TGF-β2 *in vivo*, and connective tissue growth factor, which is an important downstream mediator of the effects of TGF-β2 on TM ECM turnover. Under normal conditions, factors of the bone morphogenetic family (BMP-7 and BMP-4) antagonize the action of TGF-β2 on ECM deposition. The balance between BMPs and TGF-β2 appears to shift to TGF-β2 in POAG.
Conclusions: 1. In POAG, there is an abnormally high aqueous humor outflow resistance in the TM outflow pathways; 2. There is increasing evidence that changes in the amount and quality of the ECM play a critical role; 3. TGF-β2 signaling mediates a pathological increase in ECM deposition.

D2-03 PATHOPHYSIOLOGY OF PIGMENTARY GLAUCOMA
R. Ritch
New York, NY, USA

Objective: To describe the pathophysiology of pigment dispersion syndrome and pigmentary glaucoma.
Main Message: Pigment dispersion syndrome (PDS) is an autosomal dominant disorder which usually has its onset in the third decade and begins to regress toward the end of the fourth decade, concomitant with the onset of presbyopia. It affects Caucasions almost exclusively and is characterized by disruption of the iris pigment epithelium and deposition of pigment granules on the structures of the anterior segment. Pigment accumulation in the trabecular meshwork can lead to progressive trabecular dysfunction and ocular hypertension with or without associated glaucomatous optic neuropathy. While primary open-angle glaucoma usually begins after age 40, pigmentary glaucoma typically affects younger individuals. Abnormally extensive iridolenticular contact, due perhaps either to a less rigid than normal iris or and iris which is too large relative to the anterior segment, produces a situation in which pressure in the anterior chamber is greater than that in the posterior chamber (reverse pupillary block), causing posterior bowing of the mid-peripheral iris, which appears on ultrasound biomicroscopy as a topographical concavity. Iridozonular friction leads to dispersion of pigment particles throughout the anterior chamber.
The iris concavity increases during accommodation and lessens with the onset of presbyopia, while inhibiting blinking reverses the iris contour from concave to convex. The proposed role of accommodation in the development of the phenotypic manifestations suggests alternative routes of therapy beyond lowering of IOP. A gene affecting the development

of the middle third of the eye early in the third trimester appears at the present time to be the most likely cause, particularly a mutation in the serotonin, dopamine, or tyrosine metabolic pathways.
Conclusions: 1. PDS/PG has a unique cause and mechanism of development; 2. Identification of the responsible gene will answer many questions; 3. Treatment should be guided toward the underlying mechanism and not just elevated IOP.

D2-04 PATHOPHYSIOLOGY OF PSEUDOEXFOLIATION GLAUCOMA
U. Schlötzer-Schrehardt
Erlangen, Germany

Objective: Pseudoexfoliation (PEX) glaucoma is the most common identifiable cause of open-angle glaucoma worldwide comprising the majority of glaucoma in some countries. The underlying disorder, PEX syndrome, is a generalized process of the extracellular matrix characterized by the production and progressive accumulation of a fibrillar extracellular material in intra- and extraocular tissues. An emerging clinical spectrum of associations with cardiovascular and cerebrovascular diseases appears to elevate PEX syndrome/glaucoma to a condition of general medical importance. New insights into its molecular pathophysiology have increased the understanding of this disorder and the current concepts of pathogenetic mechanisms will be reviewed in this lecture.
Main Message: Recent molecular biologic data support the pathogenetic concept of PEX syndrome as a type of stress-induced elastosis, an elastic microfibrillopathy, with TGF-ß1, increased oxidative stress, and low grade inflammatory processes being key factors in pathogenesis. Active involvement of trabecular meshwork cells in local production of PEX material in the juxtacanalicular area may be the primary cause of outflow resistance and chronic pressure elevation in PEX patients. Additional pathogenetic factors include marked pigment dispersion, increased aqueous humor protein concentrations, and pressure-independent risk factors including an impaired ocular and retrobulbar perfusion.
Conclusions: PEX syndrome may not only cause severe open-angle glaucoma but also a spectrum of other ocular complications and imply an increased risk for cardiovascular disease. A thorough awareness of its pathologic features and its effects on ocular tissues is critical for an early recognition and accurate diagnosis as well as for an understanding of the multifactorial aspects of this clinically important fibrotic disorder.

D2-05 PATHOPHYSIOLOGY OF NPG
M.B. Wax
Dallas, TX, USA

Objective: To review the retina and optic nerve stress conditions that occur in (but are not limited solely to) normal pressure glaucoma
Main Message: In addition to idiopathic causes that remain unknown, the pathogenesis of NPG is likely due to aberrant stress to the retinal and optic nerve tissues. This may include a genetic predisposition to intrinsic nerve damage or exquisite susceptibility to physiological conditions that normally pose no threat of progressive optic nerve or retinal ganglion cell demise. Such conditions may be manifest clinically as: 1. Vasospasm as occurs in patients with migraine disease; 2. Vascular compromise as occurs in atherosclerotic disease; 3. Altered scleral or optic nerve head structural morphology as may occur in high myopia; 4. Anti-phospholipid antibody syndrome; 5. Genetic associated (i.e. OPA-1/optineurin/myocillin); 6. Sleep apnea; 7. Presumed autoimmune glaucoma (*i.e.*, anti-retinal/systemic antibodies); 8. Decreased diastolic perfusion pressure (*i.e.*, acute as in hypovolemic shock or chronic as nocturnal systemic hypotension).
Conclusion: The treatment of patients with glaucoma, including NPG, is often most appropriate when tailored to the specific retinal/optic nerve stress conditions that a patient manifests. It is widely accepted that virtually all glaucomatous disease includes a component of pressure-dependent retinal or optic nerve head stress. Thus IOP lowering is a mainstream therapy for all glaucoma including NPG. However, the elucidation of the non-pressure dependent stressors may often be highly beneficial in treating patients. In NPG, non-pressure dependent causes of glaucomatous optic neuropathy are likely to predominant which may underlie disease pathogenesis, at least in part.

10.30-12.00 a.m.

D3+4 CONSENSUS ON INTRAOCULAR PRESSURE

Main Message: The Intraocular Pressure consensus reached a crescendo with the stimulating and provocative meeting held in Fort Lauderdale on May 5, 2007. The resulting consensus points will be presented during this congress in a special session. The book with the complete report should be available at the time of the World Glaucoma Congress in Singapore.

Measurement of Intraocular Pressure

1. Precision and agreement of tonometry devices should be reported in a standardized format:
   – Coefficient of repeatability (for intra-observer variation)
   – Mean difference (or difference trend over range) and 95% limits of agreement (for inter-observer and inter-instrument differences)
2. Correction Nomograms that adjust GAT IOP based solely on CCT are neither valid nor useful in individual patients.
3. Measurement of CCT is important in assessing risk for incident glaucoma among ocular hypertensives in the clinical setting, though the association between CCT and glaucoma risk maybe less strong in the population at large.

Intraocular Pressure as a Risk Factor

4. There is *strong evidence* to support higher mean IOP as a significant risk factor for the development of glaucoma.
5. There is *strong evidence* to support higher mean IOP as a significant risk factor for glaucoma progression.
6. There is currently *insufficient evidence* to support 24-hour IOP fluctuation as a risk factor for glaucoma development or progression.
7. There is currently *insufficient evidence* to support IOP variation over periods longer than 24 hours as a risk factor for glaucoma development and progression.

Target Intraocular Pressure

8. The determination of a target IOP is based upon consideration of the amount of glaucoma damage, the IOP at

which the damage has occurred, the life expectancy of the patient, and other factors including status of the fellow eye and family history of severe glaucoma.

Friday, July 20, 2007

8.30-9.15 a.m.

D5-01 WHERE ARE WE IN GENETICS?
W.L.M. Alward

Objective: To review the current knowledge of the genetic basis of glaucoma and to discuss methods that might lead to future discovery.
Main Message: There are 9 published genetic loci for primary open angle glaucoma (GLC1A – GLC1I). The genes have been identified at three of these loci (myocilin, optineurin and WDR36). Genes have been identified for primary congenital glaucoma (CYP1B1) and syndromic glaucomas such as Axenfeld-Rieger syndrome (PITX2 and FOXC1) and aniridia (PAX6). However, the genetic basis of the vast majority of glaucomas remains to be discovered. New methods of research including animal studies, bioinformatic modeling and gene chip studies hold promise to accelerate the discovery of disease-causing genes. Knowledge of the genetic basis of glaucoma should lead to a better understanding of these diseases and ultimately to better diagnostic tools and treatments.
Conclusion: Genetic studies hold promise to improve our diagnosis and treatment of this family of diseases. New methodologies should help discover the underlying genetic basis for glaucoma and help to unravel the complex pathways that lead to this blinding disease.

D5-02 RISK FACTORS FOR ACG
M. He
New York, NY, USA

Objective: To summarize the current major findings on the risk factors for primary angle closure (PAC).
Main Message: The prevalence of PAC increases with age and female gender is recognized as a major predisposing factor toward development of PAC. A small eye with a shallow anterior chamber, shorter axial length, small corneal diameter and steep curvature, and a thick relatively anteriorly positioned lens are all considered as ocular anatomical risk factors for PAC. Familial tendency of PAC is observed and inheritance pattern is proposed from early work in Eskimos people. Extreme climatic conditions, medications agents and choroidal detachments are reported as external factors for symptomatic PAC.
Conclusions: Despite the increasing number of identified risk factors and sophistication of our theory of angle closure, we still do not fully understand the reasons for angle closure in many cases. The paucity of prospective natural history data is the major scientific deficiency.

D5-03 RISK FACTORS IN OAG
S. Miglior
Monza, Italy

Objective: To review the risk factors for onset/progression of OAG.
Main Message: The risk factors for the onset and/or progression of OAG are more accurately detected in prospective clinical trials and in population-based surveys, due to the greatest power and generalizability of these study designs. Several risk factors have been in so far reported and confirmed by several studies. As far as the onset of OAG is concerned, high IOP, thin CCT, large vertical cup/disc ratio, high vertical cup/disc ratio asymmetry between the two eyes, high Pattern Standard Deviation (within its normal limits) of the visual field, the occurrence of optic disc hemorrhages, the treatment with systemic diuretics or calcium channel blockers, PEX, PDS, low diastolic perfusion pressure and age have been reported in several RCTs (OHTS, EGPS, Malmo Study) and in population based studies (Baltimore, BISED, Egna, Rotterdam, Projecto VER). As far as progression of OAG is concerned, high IOP, PEX, the occurrence of optic disc hemorrhages, a high number of glaucoma surgeries, migraine, and age have been reported in several RCTs (EMGT, AGIS, CNTGS). Other potential risk factors such as the high inter-visit IOP fluctuation, myopia, and diabetes have not been consistently reported and need further studies to better elucidate their possible role in the onset/progression of OAG.
Conclusions: 1. RCTs and population-based studies may help in accurately detecting risk factors for onset/progression of glaucoma; 2. An accurate search of risk factors is clinically useful in the management of high risk glaucoma patients and OAG patients.

D5-04 ARE RISK FACTORS FOR CONVERSION THE SAME AS FOR PROGRESSION?
D. Garway-Heath
London, UK

Objective: To evaluate the literature for evidence concerning risk factors for 'conversion' from ocular hypertension to glaucoma and for 'progression' of established glaucoma.
Main Message: The best evidence comes from randomized treatment trials. Consistent risk factors for both 'conversion' and 'progression' are older age and higher intraocular pressure. Pseudoexfoliation and disc haemorrhages have also been reported to be independent risk factors for both 'conversion' and 'progression'. A thinner central corneal thickness (CCT) is a risk factor for 'conversion'. Treatment effects confound interpretation of the role of CCT in clinical studies; CCT has yet to be reported as a risk for progression in a randomized treatment trial of manifest glaucoma. Signs related to glaucoma, such as an increased cup-to-disc ratio and higher visual field pattern standard deviation, are associated with a higher risk of 'conversion'. Stage of disease has not been reported consistently as a risk factor for 'progression'. There is inconsistent evidence for other, putative, risk factors, such as race, family history, diabetes, migraine, and myopia.
Conclusions: 'Conversion' and 'progression' likely represent the same process. The major risk factors are the same for 'conversion' and 'progression'.

D5-05 ESTIMATING GLAUCOMA PROGRESSION FROM RISK FACTORS
F.A. Medeiros
San Diego, CA, USA

Objective: To describe risk factors associated with glaucoma

progression and to identify possible strategies for combining information from these risk factors in order to predict risk of glaucoma development and progression over time.
Main Message: Risk factors associated with progression from ocular hypertension to glaucoma have been clearly identified by two major clinical trials – OHTS (Ocular Hypertension Treatment Study) and EGPS (European Glaucoma Prevention Study). Based on these trials, predictive models for disease development have been created and validated. For patients with established disease, several clinical trials have also identified risk factors for disease progression, such as the CNTGS (Collaborative Normal Tension Glaucoma Study), the AGIS (Advanced Glaucoma Intervention Study) and the EMGT (Early Manifest Glaucoma Trial). Although risk factors for disease progression have been identified by these trials, predictive models for disease progression have not yet been created. The current presentation will emphasize the difficulties and limitations associated with construction of such models.
Conclusion: 1. Risk factors associated with glaucoma development and progression have been identified in major clinical trials; 2. Although risk models for glaucoma development have been created and validated, such models are not yet available for estimating risk of progression in patients with established disease.

9.15-10.00 a.m.

D6-01 UPDATE ON FUNCTION

D. Garway-Heath
London, UK

Objective: To evaluate the literature from 2003 for changes in the evidence of the role of various tests of visual function in the diagnosis and documentation of glaucomatous damage.
Main Message: Most evidence is unchanged. However, the evidence for the role of 'selective' tests of visual function has evolved. Many previous reports, suggesting the superiority of these tests for early diagnosis, suffered from 'design bias' – most studies assessed the performance of short wavelength automated perimetry (SWAP) and frequency doubling technology perimetry (FDT) in subjects with normal standard automated perimetry (SAP), whereas no studies have reported findings for SAP in the context of normal SWAP or FDT. Using appropriate study methodology, no statistical difference has been reported in the performance between SAP, SWAP and FDT, although there is a possible trend towards a slight superiority of FDT. Other factors should be considered when assessing the clinical utility of a test – these include reproducibility, speed, portability and ease of administration.
Conclusions: 1. Visual function tests should be used to detect and document glaucoma; 2. It is unlikely that one functional test assesses the whole dynamic range; 3. SAP, as usually employed in clinical practice, is not optimal for early detection; 4. SAP, SWAP and FDT are roughly equivalent in their ability to identify early glaucomatous damage; 5. There is little evidence to support the use of a particular selective visual function test over another in clinical practice because there are few studies with adequate comparisons.

D6-02 UPDATE ON STRUCTURE

L. Zangwill
La Jolla, CA, USA

Objective: To provide an update on evidence relevant to the consensus statements on Glaucoma Diagnosis of 2003.
Main Message: The following five consensus statements regarding structural assessment for the diagnosis of glaucoma were developed at the 2003 Global AIGS Consensus Meeting on 'Structure and Function in the Management of Glaucoma': 1. A method for detecting abnormality and also documenting optic nerve structure should be part of routine clinical management of glaucoma. 2. According to limited evidence available sensitivity and specificity of imaging instruments for detection of glaucoma are comparable to that of expert interpretation of stereo colour-photography and should be considered when such expert advice is not available. 3. Digital imaging is recommended as a clinical tool to enhance and facilitate the assessment of the optic disc and retinal nerve fibre layer in the management of glaucoma. 4. Automated analysis of results using appropriate databases is helpful for identifying abnormalities consistent with glaucoma. 5. Different imaging technologies may be complementary, and detect different abnormal features in the same patients. Recent literature will be reviewed to determine whether the consensus statements need modification.
Conclusions: 1. These five consensus statements remain relevant; 2. At this time there is no need for major modification of the consensus statements on structural assessment for the diagnosis of glaucoma.

D6-03 UPDATE ON DIAGNOSIS

D. Friedman
Baltimore, MD, USA

Objective: To review the findings of the AIGS Consensus Panel on Angle-Closure Glaucoma.
Main Message: The main diagnostic criteria for angle closure and angle-closure glaucoma will be reviewed. Evidence supporting these criteria will be presented.
Conclusions: 1. Consensus panel of over 100 glaucoma specialists from around the world; 2. Agreed upon nomenclature; 3. Need for gonioscopy on all subjects.
Ongoing discussions about extent of closure needed to have angle closure.

D6-04 UPDATE ON TREATMENT: CONSENSUS ACG

T. Aung
Singapore

Objective: To review current treatment options for angle closure glaucoma (ACG)
Main Message: Recent studies have provided new information about medical therapy for ACG including the use of prostaglandins for the condition. Laser trials on the use of laser iridoplasty and selective laser trabeculoplasty have increased our options for laser treatment. New data are available on the outcomes of filtering surgery for ACG. Surgical trials for ACG are being conducted that will evaluate the role of lens extraction in this condition.
Conclusions: The latest directions in ACG treatment will be summarized.

10.30-12.00 a.m.

DB7+8-01 MEDICAL TREATMENT AND NON-PENETRATING SURGERY

A. Mermoud
Lausanne, Switzerland

Objective: To promote surgical treatment in the management of glaucoma patients.
Main Message: By comparing medication vs. surgery, the surgical option offers more advantages for the great majority of patients worldwide. This is important since glaucoma is the first cause of irreversible blindness with 82,5 million glaucoma patients around the world. The main advantages of surgery are: 1. A better IOP reduction; 2. A reduced use for compliance; 3. A reduction in IOP fluctuation; 4. Benefits in terms of economics, especially for the glaucoma patients living in developing countries corresponding to about 90% of the total number of glaucomatous patients. Among glaucoma surgery, non-penetrating filtering surgery seems to offer excellent IOP drop similar to trabeculectomy if correctly performed, but with much less post-operative complications. Deep sclerectomy may be proposed as a first therapy in patients with poor compliance and poor socio-economic status.
Conclusion: Filtering surgery and especially non-penetrating filtering surgery may offer the best option to reduce and stabilize the IOP in glaucomatous patients.

DB7+8-02 MEDICAL TREATMENT – THE ADDITIONAL EFFECT OF COMBINATION TREATMENT

K. Singh
Stanford, CA, USA

Objective: To summarize the necessity for, and limitations of, combination medical therapy in the management of glaucoma.
Main Message: There are several limitations of combining medical therapeutic agents for glaucoma including diminishing returns with regard to IOP lowering and increasing side effects. Combination therapy can make it difficult to assess tachyphylaxis, or tolerance of individual agents. There are far fewer high quality studies evaluating the benefits, side effects and risks of combination therapy relative to monotherapy for glaucoma. Despite these limitations, we must often turn to more than one agent for the management of glaucoma over the long run, even when our IOP lowering goals are relatively modest. Some combinations work better than others and there is significant inter-patient variability in the response to various agents.
Conclusions: 1. Despite the limitations of combination medical therapy for glaucoma, the need for multiple medications in many and perhaps the majority of patients with this disease make such therapy attractive in many clinical situations; 2. Two agents that work well alone may not necessarily work well in combination; 3. Significant inter-patient variability in the response to therapy creates difficulty in making broad generalizations regarding the efficacy of specific combinations.

DB7+8-03 MEDICAL TREATMENT – PLACE OF COMBINATION THERAPY

C. Migdal
London, UK

Main Message: Over the recent years, a number of combination therapies which combine two separate molecules of different hypotensive drug into one bottle have become available for glaucoma therapy. All products contain Timolol, in addition to another adjunctive agent. There are pros and cons of using combination agents, which include efficacy, ease of use, compliance on the one hand and cost and side effect profile on the other. The advantages and disadvantages of the combined therapies will be discussed, as well as indications given as to where they fit in the current glaucoma treatment algorithm.

DB7+8-04 CHOLESTEROL AND GLAUCOMA

C.A. Girkin
Birmingham, AL, USA

Objective: to review the literature on the relationship to elevated cholesterol and glaucoma.
Main Message: Recent clinical literature has suggested that elevated cholesterol may be a risk factor for open angle glaucoma and that the treatment of cholesterol may reduce the risk of glaucoma. While the mechanism of action is unclear, this may be due to direct effects on the intraocular pressure through a Rho Kinase pathway or due to indirect effects on the vasculature of the optic nerve. This presentation will review the basic and clinical literature regarding the role of cholesterol in glaucoma.
Conclusion: A clinical trial is needed to evaluate the role of cholesterol lowering in glaucoma.

DB7+8-05 TREATMENT OF NEOVASCULAR GLAUCOMA WITH ANTI-VEGF IOP

J. Jonas
Heidelberg, Germany

Objective: To report and discuss the use of intravitreal anti-VEGF drugs for the treatment of neovascular glaucoma.
Main Message: The intravitreal injection of anti-angiogenic drugs such as pegabtanib, bevacizumab, ranoibizumab and triamcinolone are effective in reducing iris neovascularization and may prevent further progression of the disease. The intravitreal application of anti-VEGF alone, however, may not be sufficient in all clinical situations to reduce the elevated intraocular pressure into the normal range. The anti-VEGF drugs may be taken in addition to surgical procedure to treat neovascular glaucoma.
Conclusions: Intravitreal application of anti-angioghenic medication may be a useful additional tool in the treatment of neovascular glaucoma.

DB7+8-06 EFFECT OF LIFESTYLE CHANGES, INCL. EXERCISE ON IOP

B. Mani
Chennai, India

Objective: To communicate the influence of lifestyle on intraocular pressure (IOP) changes, especially different forms of exercise.
Main Message: Lifestyle issues from a population based study in South India was utilised to analyse association with IOP. Forms of yoga postures were analysed for raise in IOP, especially in head stand postures. Literature search on 'exercise and IOP' included weight lifting, isokinetic and isometric exercises and psychological stress. Influence of exercise on pigment dispersion, athletes vs sedentary workers and

effect of medications in glaucoma subjects were included from literature. Urban status (Odds -2.8), Age group above 50, Smoking (Odds -1.52), Alcohol consumption and tobacco chewing (Odds -1.67) showed significant positive association with IOP. Headstand, shoulder stand and head to Knee postures showed 2, 1.5, 1.25 times raise in IOP after posture. All forms of exercise especially isokinetic exercises decreased IOP significantly however acute dynamic exercise such as weight lifting increased IOP by breath holding and venous congestion. Psychological stress increased IOP during short term period. Athletes had decreased resting IOP compared to sedentary subjects. Anti glaucoma medications. Isocapnia, Raised colloidal osmotic pressure had nullifying effect on changes in IOP after exercise. Dapiprazole and pilocarpine helped pigment dispersion subjects from having exercise induced ocular hypertension. Beta adrenergic receptor polymorphism was implicated in varying individual responses on IOP after exercise.
Conclusion: Life style changes especially exercise have documented evidence on change in IOP, however, attention need to be paid to study the influence of modifying factors in the risk of glaucoma pathogenesis or management

DB7+8-07 GLAUCOMA AND SIRNA IOP
E. Tamm
Regensburg, Germany

Objective: To discuss the mechanisms by which siRNAs silence target genes and its possible application for the treatment of glaucoma.
Main message: Silencing of target genes by siRNAs is a powerful technique to investigate cellular metabolism and the influence of specific genes. Silencing is based on a post-transcriptional mechanism that targets a specific mRNA population. The double-stranded siRNA is unwound to form a single-stranded ribonucleoprotein complex (RNA-induced silencing complex, RISC) that guides the degradation of the mRNA. This technique can also be used to silence mutated genes that might be related to disease states, and more specifically to glaucoma.
Conclusions: 1. Gene silencing by siRNAs is a powerful technique *in vitro* settings; 2. The effectiveness of silencing in glaucoma-relevant tissues in vivo is still unknown.

DB7+8-08 IN SEARCH OF… GOOD GENE DRUGS
T. Borrás
Chapel Hill, NC, USA.

Objective: Our goal is to be able to treat, in a near future, glaucoma patients with gene drugs. Genes would provide a more specific, less toxic and longer duration of action treatment than conventional drugs. In our laboratory, we are focusing on the human trabecular meshwork and following two parallel approaches.
Main Message: Using microarray chip technology, on the first approach we are identifying relevant genes whose expression is altered by conditions associated with glaucoma. On the second, we are investigating optimal delivery systems to carry the therapeutical gene directly inside the trabecular meshwork cell. We have identified a molecular signature of the human trabecular meshwork which include among others, cytoskeletal related genes (RhoA, caldesmon, tropomyosin), calcification related genes (matrix Gla, osteoglycin), stress protection proteins (myocilin, αB crystallin, chaperonin-containing TCP1) and signaling neuropeptides (substance P, secretogranin). For the delivery, we have found that one administration of second generation Adeno-associated vectors (scAAV) delivers a gene to the human trabecular meshwork in organ culture and to rats and living monkeys for two to five months without toxicity. More recently, we have been able to silence a gene by direct delivery of its complementary short interference RNA (siRNA) molecule to the human trabecular meshwork.
Conclusion: The combination of siRNA and scAAV vectors carrying the candidate gene holds good promise for developing gene transfer/gene therapy regimens for the control of elevated IOP in glaucoma.

DB7+8-09 FROM DRUGS TO GENES
P.L. Kaufman
Madison, WI, USA

Objective: To summarize advances in our understanding of the biochemical and molecular mechanisms of retinal ganglion cell (RGC) death and trabecular meshwork (TM) and ciliary muscle (CM) physiology that are resulting in novel drug delivery and gene transfer strategies for glaucoma therapy.
Main Message: Cytoskeleton modulating proteins can block the interaction of actin and myosin to inhibit focal adhesion formation, and disrupt cell-cell junctions and interactions with the extracellular matrix in the TM, increasing outflow facility. Prostaglandin (PG) biosynthetic enzymes can increase uveoscleral outflow. Neurotrophins can protect RGCs from IOP-induced apoptosis. Delivery of these proteins to the TM, CM and RGCs can be achieved through novel delivery strategies or via viral vector mediated gene transfer to achieve the desired physiologic effects.
Conclusions: 1. Disrupting the TM cytoskeleton increases outflow facility; 2. Increasing PG synthesis in the CM likely enhances uveoscleral outflow; 3. Neurotrophins can protect retinal ganglion cells; 4. The relevant proteins can be delivered to the TM, CM and RGCs via viral vector mediated gene therapy; 5. Gene therapy and novel drug delivery systems may provide long-term efficacy in glaucoma therapy and remove the patient from the delivery system.

Saturday, July 21, 2007

08.30-10.00 a.m.

D9+10 SURGICAL GRANDROUNDS

Outline for surgical grandrounds: Our primary source of postgraduate education is the experience that we gain from managing our patients as we practice our art and science throughout the years. Our experience depends on our degree of specialization and the volume of our work. Probably the best way of broadening our experience is to draw on the collective skills of our peers. The grandrounds are designed to bring together a group of highly experienced surgeons presenting interesting and challenging glaucoma surgical cases. Cases presented pertains to everyday glaucoma practice, and aims at providing practical 'how to manage' advices. Challenging the presenters and discussing the presented cases is a panel of world class experts in the field. The grandrounds aim at taking you into the operating the-

aters of both panel and presenters, and giving you a glimpse of what the experts would do. It offers you the chance of putting yourself in their shoes, or rather surgical gloves, to see how you would do it.

10.30-11.15 a.m.

D11 CONSENSUS

The Consensus Meeting on Glaucoma Surgery in Open Angle Glaucoma was held in 2005. The book appeared in the same year. The AIGS has planned to update the consensus reports at regular intervals. The present update covers the topics of: trabeculoplasty, trabeculectomy, trabeculectomy versus non-penetrating glaucoma surgery, trabeculectomy versus aqueous drainage device, cyclodestruction versus aqueous drainage device
Studies are ongoing on the comparison of trabeculectomy versus Glaucoma Drainage Devices. This important comparison will be part of the update.
Conclusions on non-penetrating glaucoma surgery:
Non penetrating glaucoma surgery is effective in lowering intraocular pressure. When compared to antimetabolite trabeculectomy it is safer but it most cases it provides higher final IOPs.
Conclusion on Aqueous drainage devices:
1. Aqueous drainage device procedures may achieve better IOP control compared with cycloablative procedures in refractory glaucoma;
2. Common tube related complications include overdrainage, tube malposition, tube blockage, corneal touch and overfibrosis;
3. The benefits of effectiveness, portability and ease of use in cycloablative procedures should be balanced against the risk of visual loss secondary to phthisis, chronic hypotony and corneal decompensation;
4. Randomized, prospective trial comparing diode cyclodestruction and glaucoma drainage device procedures are warranted to evaluate the safety and effectiveness of these procedures in the management of refractory glaucoma.
And many more conclusions to come.

11.15-12.00 a.m.

D12-01 INTRODUCTION

T. Shaarawy
Geneva, Switzerland

Main Message: The AIGS guidelines on design and reporting glaucoma surgical trials sets, for the first time, a new platform. Progress in glaucoma surgery has been hindered by the lack of consensus on how trials should be designed and reported, with subsequent difficulties in comparing published trials. In a pioneering initiative the AIGS took upon itself to invite leading researchers in the field of to compile clear guidelines on how to design and report glaucoma trials. These guidelines will be reviewed by member societies of AIGS. This session presents highlights from these guidelines.

D12-02 SURGICAL GUIDELINES ON REPORTING AND PUBLISHING – METHODOLOGY

D. Lam
Hongkong

Objective: To recommend areas in glaucoma surgery research that should be standardized such that fruitful comparisons can be made between different studies from across the world, hence facilitating the acquisition of useful information for decision-making in glaucoma surgery.
Main Message: The *AIGS Methodology Sub-Committee (AMSC)* has identified many aspects in glaucoma surgery research that could be standardized. They include the recognition of various study designs and their levels of study; the definition and collection of pre-operative data; the preferred methodology in masking, use of new techniques or treatments, and reporting complications; and the approaches to post-operative assessments. The *AMSC* wishes to bring them up for international standardization and usage.
Conclusions: 1. Despite its complexity, *AMSC* recognizes the task of formulating standards in glaucoma surgery research as both essential yet feasible to the assessment of the efficacy and safety of different glaucoma procedures; 2. The Guidelines on methodology will serve as an initiation and platform for further discussion amongst international experts.

D12-03 DEFINITIONS OF SUCCESS

M. Sherwood
Gainesville, FL, USA

Objective: The lack of consensus with respect to reporting glaucoma surgical trials has hindered communication among investigators and made comparison among studies difficult and sometimes impossible. Guidelines for defining success are proposed to help provide a framework for reporting future surgical studies.
Main Message: Intraocular pressure (IOP) reporting will inevitably be the cornerstone of success definitions, because IOP is currently the only modifiable risk factor for glaucoma and IOP reduction is the goal of current glaucoma surgery. A consensus was reached that IOP "success" needs to be reported with multiple upper limits (*i.e.*, ≤ 21, 18, 15, and 12 mmHg) and a lower limit (*i.e.*, 5 mmHg). Categorizing success in patients with preoperatively 'normal' IOPs or IOPs in the lower 20's may warrant an additional requirement of having achieved a fixed percentage IOP reduction (perhaps 20% to 40%) from preoperative levels. Successful patients need to be characterized by whether or not their IOP 'success' was achieved without (complete success) or with (qualified success) antiglaucoma medications and the number of classes of antiglaucoma medications used preoperatively and postoperatively should be reported. It is recommended that specific IOP results should be depicted graphically with scatter plots, as preoperative IOP (x-axis) versus postoperative IOP (y-axis); with distinctive symbols for postoperative IOPs with and without ocular hypotensive medications. Incorporating visual field status into the definition of success is problematic because of the fundamental difficulty of defining visual field progression, the relatively short-term nature of most surgical studies and the very compromised visual function of many patients studied. Nonetheless, mean defect of the preoperative and one-year postoperative visual fields should be reported for participants with preoperative MDs better than -15 dB.

Conclusion: Best corrected visual acuity (BCVA) testing should be standardized ideally with ETDRS charts and reported by log(MAR) values only. Visual acuity, like visual fields, has many potential confounders and consequently, it should not be an integral part of the definition of failure except in the case of loss of light perception attributable to either glaucoma progression or surgical complications.

D12-04 STATISTICAL ASPECTS OF REPORTING GLAUCOMA SURGICAL STUDIES

W.J. Feuer
Miami, FL, USA

Objective: To describe good practice for communicating results of glaucoma surgical studies.
Main Message: Following standard statistical guidelines for reporting results of surgical trials will more accurately communicate the findings of surgical research reports. These include: documentation of missing data and supplying sample sizes specific for each comparison, use of confidence intervals in addition to significance tests – the related concept of statistical power is useful for planning studies but is not an especially important feature of presenting results, choice of prospective success endpoints and analysis with methods such as Kaplan-Meier that account for follow-up time, employing tests of interaction with subgroup analyses, identification of primary versus ancillary hypotheses and appropriately caveating p-values for the latter.
Conclusions: Good statistical practice for communicating results of glaucoma surgical trials includes, particularly: 1. Use of confidence intervals; 2. Appropriate accounting for follow-up time; 3. Differentiation between primary and ancillary hypotheses.

D12-05 GUIDELINES ON REPORTING AND PUBLISHING OF SURGICAL COMPLICATIONS

R. Stamper
San Francisco, CA, USA

Objective: To develop guidelines for reporting and publishing of glaucoma surgical complications.
Method: Several glaucoma experts contributed ideas on what were the important issues in reporting surgical complications. These were collated on a web site with each contributor having an opportunity to make suggestions. The document was then honed down to those issues that all could agree upon (or agree to disagree).
Main Message: In any report of a new or old surgical technique, complications should be reported as to the time of onset after surgery (early – 1st post-op month, late – onset after 1 month, early and late, present at last visit). Loss of visual acuity should be reported in Snellen or ETDRS lines. Non-physiological intraocular pressure that may or may not lead to associated complications, such as shallow anterior chamber, choroidal detachment, and hypotony maculopathy, should also be reported, along with intraocular bleeding, lens opacity, retinal disease such as vein occlusion or macular hole, inflammation, corneal or corneal graft decompensation. Complications specific to trabeculectomy or other anterior filtering procedures related to bleb dysthesia, leakage or infection need to be reported. Furthermore, complications specific to drainage devises should include tube or plate exposure, corneal touch, or tube retraction, Tables are provided for convenience in planning a study or report.
Conclusions: Complications of glaucoma surgery should be reported within the context of timing after surgery, severity, and risk to visual function. A template and set of guidelines are provided for use in planning or reporting the results of glaucoma surgery.

D12-06 ECONOMICS AND GLAUCOMA SURGICAL TRIALS

A. Azuara-Blanco
Aberdeen, UK

Objective: 1. To highlight the importance of economic evaluations in health care and, specifically, in the design of glaucoma surgical trials; 2. To briefly describe types of economic evaluations and how can they be conducted.
Main Message: Economic evaluations such as cost-effectiveness and cost-utility analyses are essential components of a glaucoma surgical trial and should be considered main outcome measures.
Conclusions: 1. Economic evaluations include information on costs, clinical effectiveness measures, quality of life, and other aspects of the value that individuals place on care and the effects of care; 2. Different types of economic evaluations can be conducted. For example, evaluation of the cost of disease (cost to health providers, society, and patient), cost-benefit, cost minimization, cost effectiveness and cost utility; 3. Economic studies include evaluation of patients' and the general public's preferences for health states associated with vision problems; 4. Economic evaluations provide policy makers and clinicians information that can be used to make decisions on patients care.

D12-07 SURGICAL GUIDELINES ON REPORTING AND PUBLISHING - CONCLUSIONS

F. Grehn
Würzburg, Germany

Objective: A uniform frame of reporting and publishing surgical results is urgently needed to make surgical studies better comparable.
Main message: The endpoint results and success rates are best described by a scattergram of original data, where different types of success criteria can be applied for comparison of studies. The time course of results is best shown in Kaplan Meier curves and in box plot graphs over time. An adequate planning of statistical methods prior to patient recruitment is crucial. Outcome comparisons between studies depend also on adequate reporting of complications.
Conclusions: 1. Adequate statistical planning; 2. Uniform description and graphical representation of data; 3. Uniform and clear description of complications; 4. Adequate ethical set-up of study.

VIDEO SESSION

The surgical video sessions are designed to provide attendees with a visual perspective on important surgical techniques. These sessions are divided into two parts: a basic and advanced focus on glaucoma and related disease. International faculty will cover a specified topic with a video presentation followed by discussion by an expert panel.

BASIC AND CLINICAL SCIENCE SESSIONS

Tuesday, July 19, 2007

8.30-9.15 a.m.

B1-01 HOW DOES THE EYE REGULATE IOP?

P.L. Kaufman
Madison, WI, USA

Objective: To provide a review of how the eye regulates IOP.
Main message: The balance between aqueous humor inflow and outflow determines what the IOP will be. Within each of these categories, several pathways may be involved. Aqueous humor formation is the result of three physiologic processes: diffusion, ultrafiltration and active secretion. Aqueous humor outflow occurs principally via the trabecular and the uveoscleral routes. Nerve terminals and mechanoreceptors within the eye may sense changes in IOP and trigger responses to alter inflow and outflow. Extracellular matrix synthesis and degradation are ongoing processes that also contribute to the resistance to fluid outflow. Contraction and relaxation in both the trabecular meshwork and ciliary muscle can regulate fluid outflow. Diurnal variation in IOP results largely from fluctuations in catecholaminergic regulators.
Conclusions: Many pathways interact to regulate IOP: 1. Cholinergic mechanisms; 2. Adrenergic mechanisms; 3. Prostaglandin mechanisms; 4. Corticosteroid mechanisms; 5. Nitrergic, serotonergic, dopaminergic, cannabinoid mechanisms; 6. Cytoskeletal and cell junctional mechanisms; 7. Mechanoreceptors, trigeminal nerves; 8. Extracellular matrix synthesis and degradation; 9. Blood flow.

B1-02 WHAT HAPPENS TO IOP OVER 24 HOURS?

J.H.K. Liu
La Jolla, CA, USA

Objective: To review 24-hour IOP patterns in healthy and glaucomatous eyes.
Main message: Many physiological and environmental conditions can affect IOP. A single IOP reading during clinic hours does not reveal the whole 24-hour IOP picture. A diurnal curve with measurements of IOP at different clock time points provides useful information. These IOP readings only capture a portion of the 24-hour IOP variation. Measurements of IOP during the nocturnal/sleep period can provide additional information. Studies performed in a sleep laboratory clearly indicate that the habitual IOPs (sitting during the day and supine at night) are higher during the nocturnal/sleep period than during the diurnal/wake period in healthy eyes and in most open-angle glaucomatous eyes. In healthy eyes, nocturnal IOP is higher than diurnal IOP in the same body position. Compared with healthy eyes, IOP in most glaucomatous eyes is elevated at all clock time points. The elevation is smaller during the nocturnal period than during the diurnal period. When 24-hour IOP measurements are obtained only in the sitting position, diurnal IOP is likely higher than the nocturnal IOP in glaucoma patients. However, this 24-hour IOP pattern rarely occurs in a real-life situation. When a patient assumes the recumbent body position for sleep, IOP immediately increases due to the increase of episcleral venous pressure and the redistribution of body fluid. Peak 24-hour IOP often occurs within the nocturnal period. Although aqueous humor flow is reduced significantly at night, this reduction obviously is not sufficient to counterbalance the overall elevation of habitual IOP during the nocturnal period.
Conclusions: 1. Habitual 24-hour IOP peaks at night in most cases; 2. IOP is higher than normal for 24 hours in most glaucomatous eyes; 3. Sitting IOP at night is not physiological.

B1-03 24-HOUR IOP CONTROL: MEDICATIONS VERSUS SURGERY

A.G.P. Konstas
Thessaloniki, Greece

Objective: To present and discuss evidence comparing 24-hour intraocular pressure (IOP) control with surgery versus medical therapy.
Main message: A well-functioning trabeculectomy provides a statistically lower mean, peak and fluctuation of IOP over the 24-hour day than medical therapy.
Conclusions: 1. New insights over the last few years have increased the importance of monitoring 24-hour IOP control in glaucoma; 2. Published evidence suggests that prostaglandins and fixed combinations provide good 24-hour IOP control; 3. Successful surgery provides better quality of 24-hour IOP control than successful medical therapy.

B1-04 HOW MUCH DOES IOP FLUCTUATION MATTER?

A. Heijl
Malmö, Sweden

Objective: This presentation will briefly but critically review the results of studies dealing with IOP fluctuations as risk factors for progression of manifest glaucoma. Studies include several papers that have been cited much to support the position that IOP fluctuations are an important and independent risk factor for progression, but also papers that come to the opposite conclusion including more recent publications. Strengths and weaknesses of the studies will be discussed.
Main message: The review will demonstrate that there is clear evidence that the level of IOP is very important for disease progression, but that there no conclusive evidence supporting that fluctuations of IOP are an independent risk.
Conclusions: High IOP level has high-level evidence as a risk factor for progression, IOP fluctuations do not.

B1-05 WHAT IS NEEDED FOR CONTINUOUS IOP MEASUREMENT?

A. Sit
Rochester, MN, USA

Objective: To discuss the paradigms for continuous intraocular pressure (IOP) measurement
Main message: Intraocular pressure is a dynamic physiologic parameter. It follows a circadian rhythm with highest readings occurring during the nocturnal period when measured in the habitual positions. In addition, IOP undergoes random fluctuations over short and long time intervals. Current

methods of measuring IOP are sub-optimal. Current clinical practice involves only intermittent measurement of IOP during regular office hours. Diurnal pressure measurements will only record IOP every 1-2 hours during office hours. Even 24-hour sleep laboratories are limited to IOP measurements every 1-2 hours, and cannot give a true sleeping IOP since patients must be awakened for measurements. Continuous IOP measurement will likely involve two paradigms. First, a non-invasive paradigm, possibly involving a contact lens based pressure sensor, would be used to measure 24-hour IOP on a periodic basis. It may be utilized for assessment of glaucoma suspects and newly diagnosed glaucoma patients, as well as monitoring of low risk established glaucoma patients. A more invasive modality may be necessary for advanced glaucoma patients to allow continuous monitoring of IOP on a permanent basis using an implantable pressure sensor. This would allow alerts to be set in case IOP deviates outside of a specified target range for a predetermined duration. Therapeutic changes could then be made as necessary. Both modalities will likely involve wireless communication with an external data collection system.
Conclusions: 1. Current methods of measuring IOP are inadequate; 2. Continuous monitoring of IOP will likely involve two different forms: a non-invasive for periodic monitoring of 24-hour IOP, and an implantable form for permanent monitoring of 24-hour IOP.

09.15 –10.00 a.m.

B2-01 INTRODUCTION TO RISK MODELLING IN GLAUCOMA

P. Healey
Sydney, Australia

Objective: To understand why and how we model risk in glaucoma and the benefits and limitations of modelling.
Main Message: Treatment and follow-up decisions in glaucoma are based on ophthalmologists' perception of their patients' likely future disease state and disability over their lifetime. Clinical risk estimates have traditionally been made in medicine by first hand knowledge of natural and treated history and rely on the assumption that similar disease in similar patients will behave in a similar fashion. But glaucoma is so variable, it is hard to know what and who is similar. If we take a large group of patients who have been studied carefully, and identify factors that appear to influence their outcome, we can mathematically model the average strength of individual risk factors for an average patient at the start of the study that are associated with a given outcome and the end of the study. If our own patients are similar enough to the group studied, we can measure the risk factors in our patients and calculate what their average outcome would have been if they were in the study. But risk factors (sometimes important ones) are almost always left out of such models because they were not studied or not known.
Conclusions: 1. Making individual risk estimates is fundamental to clinical glaucoma management; 2. Published study groups provide a convenient comparison group if they are carefully studied and representative of our own patients; 3. Mathematical risk models from these studies can predict an average outcome for our own patients within the limitations of the model; 4. Unless the comparison group and its treatment is very similar to our own patients, risk models are unlikely to give an accurate prediction of progression or outcome.

B2-02 IS RISK PREDICTING BY OPHTHALMOLOGISTS CONSISTENT?

S. Mansberger
Portland, OR, USA

Main message: Ocular hypertension is present in approximately 5% of adults over the age of 40 years. While ocular hypertension is a common finding, eye care providers do not know which patients to treat or which patients to monitor without treatment. Treating all ocular hypertensives is too expensive, but avoiding treatment of all ocular hypertensive patients may needlessly increase the risk of glaucoma in susceptible patients. The Ocular Hypertensive Study and the European Glaucoma Prevention Study demonstrated that age, corneal thickness, intraocular pressure (IOP), pattern standard deviation (PSD), and vertical cup-to-disc ratio (C/D) were independent, predictive variables for the development of glaucomatous optic disc or visual field changes. However, applying these findings to individual patients remains difficult, because each patient encompasses a unique combination of risk factors that the clinician must take into account. My lecture will investigate the ability of ophthalmologists to estimate an individual's risk of converting from ocular hypertension to glaucoma, and to compare these estimates to a risk calculator. Overall, ophthalmologists showed a high range of estimates for the probability of developing glaucoma in the same ocular hypertensive patients. This may lead to either under or over treatment of patients. Clinicians need a more exact method to determine the probability of glaucoma from ocular hypertension.

B2-03 HOW DOES THE CORNEA CONTRIBUTE TO GLAUCOMA RISK

L.E. Pillunat
Dresden, Germany

Objective: The central corneal thickness (CCT) is an important factor to consider in applanation tonometry. Thin corneas lead to an underestimationof the true IOP. Additionally, CCT is thought to represent an independent risk factor for the development and progression of glaucoma.
Main Message: Measurements of the biomechanical properties of the cornea under several influencing factors (advanved glycation endproducts, estrogen) were compared with results from the literature. Pathophysiologic-biomechanical relations between cornea and glaucoma were used for the explanation of the important role of the cornea in glaucoma. With age the cornea gets stiffer and thinner. The increase of stiffness is caused especially by the advanced glycation endproducts (AGEs). With age and in glaucoma patients the level of AGEs are elevated. Age is a risk factor for glaucoma. The sclera is also stiffer in glaucoma. Biomechanical models show that the stiffness of the sclera was the most important factor for determining the vulnerability of the optic nerve head to increased IOP. The corneal and scleral elasticity contribute to the damping of acute intraocular pressure spikes. This buffering mechanism of the eye is realized by a high elastic distensibility of the cornea or sclera. From our biomechanical studies with estogen we found an increased distensibility of the cornea and the lamina cribrosa with estrogen. This increased distensibility may be caused by an

elevated production of glycosaminoglycans due to estrogen. It is known that hormone replacement therapy (HRT) reduces the risk for glaucoma. HRT also increase the thickness of the cornea due to the synthese of GAG.
Conclusions: A thin cornea seems to be an independent risk factor for glaucoma and is an indicator for a lower level of GAG in the eye. These GAG with their high water binding capacity maintains the flexibility of the tissues (sclera, trabecular meshwork, lamina cribrosa) and protects the ONH.

B2-04 PREDICTING RISK FROM VISUAL FIELD ANALYSIS
A.Viswanathan
London, UK

Objective: To examine the reported strength of association between various psychophysical measures and a variety of adverse outcomes.
Main Message: Visual field tests, if appropriately interpreted, may be used to predict conversion to glaucoma, progression of glaucoma and the likelihood of real world outcomes such as loss of driving licence, motor vehicle collisions and falls.
Conclusion: Visual field analysis is a crucial component of risk stratification in glaucoma.

B2-05 VALIDATION OF RISK MODELS FOR DEVELOPMENT OF GLAUCOMA
F. Medeiros, R. Weinreb
La Jolla, CA, USA

Objective: In order for risk models to have optimal use and acceptability, clinicians need to be confident that the prediction functions can be transferred to other settings beyond where they were originally derived. In this session, we describe the steps necessary to validate a predictive model to estimate risk of glaucoma development.
Main Message: Validation of a predictive model should involve assessment of its discrimination ability and calibration. In the context of risk models for conversion from ocular hypertension to glaucoma, discrimination is the ability of a predictive model to separate those ocular hypertensive patients who develop glaucoma from those who do not, *i.e,* it is an estimate of the probability that the model assigns a higher risk for those who develop glaucoma than those who do not. Discrimination can be assessed by calculating the *c*-index as proposed by Harrell. Calibration measures how closely predicted outcomes agree with actual outcomes. A Hosmer-Lemeshow test can be used to assess calibration. Proposed risk models for development of glaucoma have been validated on independent populations and shown to have acceptable discrimination and calibration. Limitations of the current validated models will be discussed.
Conclusions: 1. Validation of a predictive model is a fundamental step before a model can be incorporated into clinical practice; 2. Risk models for development of glaucoma have been successfully validated in independent populations; 3. Validation in populations other than Caucasians is necessary before current models can be used in other racial groups.

10.30-11.15 a.m.

B3-01 PATHS OF RETINAL GANGLION CELL DEATH
H. Quigley

Baltimore, MD, USA

Objective: To present recent research findings that explain glaucoma damage.
Main Message: Glaucoma is recognized when physical excavation of the optic disc and functional loss of visual field are documented. These alterations are produced by various abnormalities that disturb the normal balance between survival and destructive forces surrounding retinal ganglion cells (RGC). The documented clinical risk factors and laboratory evidence point to an important role for the sclera in responding to eye pressure (IOP) level and transmitting force to the nerve head's lamina cribrosa. These forces lead to responses in RGC axons, capillaries, and resident cells, including glia and connective tissue cells. The injury and effects produced at the nerve head are signaled to the RGC body both by molecules that are not normally returned there, and by the blockage of arrival of normally transmitted messages (positive and negative signaling). Among the negative signals, neurotrophin withdrawal is one documented event that leads to RGC programmed cell death or apoptosis. Overexpression of the neurotrophins BDNF and CNTF have been shown to decrease RGC loss in experimental glaucoma. One strong candidate as a positive signal is JNK, a molecule that leads to activation of both survival and cell death factors at the RGC body. Other molecules and pathways known to be involved in RGC death in glaucoma are: endothelin, tumor necrosis factor alpha, oxidative free radicals including nitric oxide, and immune dysregulation. Once RGC death becomes a regular phenomenon due to primary glaucoma disease, additional RGC are likely to die due to toxic influences set up by the changed ecology of the retina – this is called secondary degeneration.
Conclusions: 1. RGC death in glaucoma occurs in a changed ecology in the retina that has both survival and destruction pathways operating simultaneously; 2. The proliferation of known features of glaucoma injury point to multiple opportunities to block RGC death (neuroprotection) in addition to lowering of IOP.

B3-02 RETINAL GANGLION CELL-GLIA INTERACTIONS IN GLAUCOMA
M. Rosario Hernandez
Chicago, Il, USA

Main message: Primary open angle glaucoma is a common eye disease, characterized by loss of the axons of the retinal ganglion cells (RGC) leading to a characteristic scotoma and progressive loss of vision. Elevated intraocular pressure (IOP) and aging are the most common risk factors associated with the disease. The site of damage to the axons is at the level of the lamina cribrosa in the optic nerve head (ONH) and previous studies in human glaucoma and in experimental glaucoma in monkeys have established a relationship between chronic elevation of IOP and remodeling of the ONH tissues, known clinically as cupping of the optic disc. The mechanism of axonal loss and, subsequently, the development of a visual field defect most likely involve local changes in glial activity, particularly astrocytes in the ONH.

The major cell type in the ONH is the astrocyte and there are significant homeostatic interactions between RGC axons and astrocytes. Astrocytes participate actively in the remodeling of neural tissues during development. In glaucomatous optic neuropathy, astrocytes play a major role in the remodeling of the extracellular matrix, synthesizing growth factors and producing cellular mediators that may affect directly, or indirectly, survival of the axons of the RGCs. Major axonal support functions of astrocytes, for example rapid cell-to-cell communication, release of chemical mediators that affect axons and blood vessels and detection of changes in the microenvironment, are likely lost in glaucomatous optic neuropathy. Astrocytes may be directly sensitive to elevated IOP, which could trigger physiological and/or pathological responses. In the retina, a specialized glia, the Muller-cells (MC), plays a key role in the maintenance of the RGC-cell body, by maintaining low extracellular glutamate by uptake of the neurotransmitter, by maintaining the ionic balance during RGC activity and by buffering oxidative stress. The role of the MC in glaucoma has not been studied in detail. The molecular pathways of astrocytes which likely underlie structural changes in the ONH, loss of axons and RGC degeneration may be responsible, in part, for the susceptibility to elevated IOP and the progression of glaucomatous optic neuropathy.

B3-03 WHAT ROLE DO MITOCHONDRIA HAVE?
J. Lindsey
La Jolla, CA, USA

Main message: There is growing experimental evidence that mitochondria abnormalities in optic nerve axons can contribute to retinal ganglion cell degeneration. These abnormalities include bioenergetic declines, evidence of oxidative stress, activation of apoptosis cascades, as well as structural alterations. Bioenergetic declines may limit a number of key processes important to the maintenance of axon health and function including axonal transport, membrane organization, and action potential conduction. Oxidative stress effects may directly alter the function of key mitochondrial enzymes and may contribute to the initiation of mitochondrial programmed responses that trigger cellular apoptosis. Finally, mitochondrial structural changes may alter mitochondrial mobility as well as degrade the compartmentalization of biochemical processes such as the proton gradient that are key to normal bioenergetic function. Recent evidence suggests that increased pressure may directly contribute to these mitochondrial alterations. It remains unclear whether these changes cause, contribute to, or are in response to glaucomatous damage. Nevertheless, because these changes precede cell death, they are promising targets for treatments that can facilitate the recovery of damaged retinal ganglion cells in glaucoma.

B3-04 MODULATION OF APOPTOSIS IN GLAUCOMA
H. Levkovitch-Verbin
Tel Aviv, Israel

Objective: To demonstrate the intracellular struggle between survival and degeneration processes in retinal ganglion cells under conditions of elevated intraocular pressure and glaucoma.
Main message: Retinal ganglion cell death in glaucoma involves activation, at different time points, of multiple pro-apoptotic (the caspase family, MAP kinase pathway, Bcl2 family and p-53 pathway) and pro-survival (PI-3 Kinase/ Akt, p-ERK and the IAP family) pathways. Optic nerve degeneration in glaucoma involves similar pathways except for regulation of pro-survival pathways that may be different. Indeed, the expression of pro-survival genes as IAP-1 and XIAP is unchanged or down regulated in the nerves, suggesting greater vulnerability of the optic nerve to elevated intraocular pressure. In glaucoma, the activation of pro-apoptotic factors in the retinal ganglion cells last longer than pro-survival genes and proteins, resulting in cells death. Further more, pro-apoptotic genes and proteins are activated long after intraocular pressure returns to baseline, suggesting that secondary degeneration play a role in glaucoma.
Conclusion: Endogenous neuroprotection has a significant role in retinal ganglion cells death in glaucoma. However, this self-protecting mechanism does not involve the optic nerves in glaucoma.

B3-05 OXIDATIVE INJURY IN GLAUCOMA
J. Flammer
Basel, Switzerland

Main message: Oxidative stress is involved in functional and structural damage in more or less all inflammatory and degenerative diseases. In glaucoma patients a number of observations indicate an oxidative stress – both in the eye and systemically. Oxidative stress damages the trabecular meshwork and thereby increases intraocular pressure. Oxidative stress, however, is even more involved in the damage of the optic nerve and the retinal ganglion cells. The simultaneous production of nitricoxide ($NO^{\cdot}$) in the ganglian cells and superoxide anions (O2-) in the mitochondrias of the axons leads to the very damaging peroxinitrate (0N00-).
Conclusion: Some systemic findings like an increase in DNA breaks, upregulation of Endothelin-1 and MMP-9 and the increased proteasome acitivity, support the hypothesis of a oxidative stress in glaucoma patients.

11.15-12.00 a.m.

B4-01 MECHANICAL INJURY AT THE OPTIC NERVE HEAD
C. Burgoyne
Portland, OR, USA

Objective: To explain how mechanical injury to the axons fits into the larger concept of the Optic Nerve Head as a Biomechanical Structure.
Main Message: IOP-related connective tissue stress and strain can induce not only mechanical compression of axons within the lamina cribrosa, but should also influence laminar blood flow, laminar nutrient delivery and laminar astrocyte molecular biology in ways that are equally threatening to axonal transport. In addition, the optic nerve head connective tissues should themselves be vulnerable to primary damage from non-IOP-related insults which then leave them secondarily weakened and vulnerable to the effects of IOP (whether normal or elevated). While the notion of IOP-induced axonal compression is intuitive, it is important to recognize that IOP can mediate damage to both the axons and connective tissues by additional mechanisms that have not traditionally been thought of as 'IOP-related'. Until proven otherwise, we should expect that the primary mechanisms of axonal and

connective tissue insult in glaucoma will vary both regionally within the nerve at any given point in time and longitudinally, within each region, over the course of the neuropathy as the connective tissues, astrocytes and axons respond to damage.
Conclusions: 1. Mechanical injury at the optic nerve head is more than physical compression of the axons; 2. IOP-related mechanisms of axonal damage are likely to be multifactorial; 3. IOP-related mechanisms of connective tissue damage are likely to be multifactorial; 4. Improving laminar and peripapillary scleral stability (if it does not reduce laminar blood flow and nutrient diffusion), improving laminar blood flow and calming activated optic nerve head astrocytes should all enhance axonal transport, but the efficacy of each intervention, once available, will need to be proven.

B4-02 IMAGING SICK AND DYING RETINAL GANGLION CELLS
J. Crowston
Melbourne, Australia

Main message: Glaucoma is characterized by the accelerated loss of retinal ganglion cells and their axons leading to a change in optic nerve structure and function. Current imaging techniques that are used to assist in the diagnosis of glaucoma or for monitoring glaucoma progression, depend on the detection of structural change to the optic nerve or retinal nerve fibre layer. A major limitation to this approach is that a large number of ganglion cells need to be lost before structural change is reliably detected. Recent advances in the fields of imaging and biofluorescence technology permit discrimination of individual retinal ganglion cells in-vivo, in animal models. An increased understanding of the neuronal response to injury also holds promise for the discovery of suitable biomarkers that can be used to identify sick or dying retinal ganglion cells. This talk will outline existing and future strategies for identifying injured or dying neurons. In addition, I will highlight some of the obstacles that remain including and emphasize the need for rigorous validation and assessment of the safety and reproducibility of new techniques.
Conclusion: In-vivo detection of sick or dying retinal ganglion cells promises a major advance in our ability to detect glaucoma progression or the response to treatment.

B4-03 HOW DOES AXONAL INJURY KILL RETINAL GANGLION CELLS?
K. Martin
Cambridge, UK

Objective: To review the mechanisms by which axonal injury may cause retinal ganglion cell death and to discuss the relevance to glaucoma.
Main message: Axonal degeneration occurs by active mechanisms distinct from apoptosis. The way in which axons die may be determined by the nature of the injury. For example, massive focal injury may cause rapid, Wallarian-type degeneration whereas more chronic, milder injuries may cause slow 'bying back' of axons over many weeks. The mechanisms by which axonal injury causes retinal ganglion cell body death in glaucoma remain incompletely understood. Interruption to axonal transport and signalling from axon to cell body are likely to be important.
Conclusions: 1. Keeping retinal ganglion cell bodies alive in glaucoma is necessary but not sufficient to maintain visual function; it is crucial that axons remain healthy and connected to their target neurons; 2. Axonal death progresses by mechanisms different to cell body death, suggesting that different treatment strategies may be relevant; 3. The 'death signals' by which axonal injury triggers cell body death remain incompletely understood and are an important topic for further research.

B4-04 UNDERSTANDING RGC SOMATIC VERSUS AXONAL DEGENERATION IN GLAUCOMATOUS OPTIC NEUROPATHY
M. Wax
Dallas, TX, USA

Objective: To understand the cell death mechanisms involving two loci in RGCs (cell body vs. axon) and how they each may contribute to the pathogenesis of glaucomatous optic neuropathy.
Main Message: Conventional wisdom suggests that a major site of damage in glaucoma associated with elevated intraocular pressure occurs at the optic nerve head and thus the disease comprises an axonopathy. However, experimental evidence also suggests that the initial insult that occurs in some patients may comprise a cytopathy of the RGC body or even a gliopathy in which glaucomatous neuropathy is triggered by sick macro and microglia in the retina or optic nerve head. Several studies employing genetic mouse strains such as the DBA/2J mouse using knockouts of key cell fate genes such as Bax, or modulation of the slow Wallerian degeneration gene (Wld^S) suggests that cell death may occur from damage in either the RGC cell body or the axon. Understanding the nature of these studies offers the promise that neuroprotective therapies can be crafted that may be unique to the sites of damage that occurs in individual glaucoma patients.
Conclusion: Strategies that hope to rescue or protect RGCs and their axons from glaucomatous injury may be based on targeting the site of the neuronal damage in specific patients. It appears that Wallerian degeneration and death of the RGC cell body are mediated by different and independent cell death pathways. Understanding the pathogenic roles of both loci, either alone or taken together, may be a necessary prerequisite to develop effective therapy for glaucoma that results from either pressure-dependent or pressure-independent retinal/ONH stress conditions.

B4-05 INTRACELLULAR CALCIUM DYSREGULATION AND NEURONAL INJURY
L. Wheeler, J. Dong, W. Hare
Irvine, CA, USA

Objective: *In vitro* and *in vivo* models have suggested that intracellular Ca^{++} dysregulation plays a critical role in neuronal injury in diseases, including retinal ganglion cell (RGC) injury in glaucoma and acute retinal ischemia. We investigated the pre- and postsynaptic as well as axonal components Ca^{++} dysregulation that contribute to RGC injury under disease conditions. We also investigated the cellular mechanisms that underlie the effect of neuroprotective agents, such as brimonidine and memantine.
Main message: Various *in vitro* models and techniques were used, including confocal Ca^{++} imaging in living rat retinal slices, simultaneous recording of ERG responses and RGC spiking activity in perfused rabbit retina, and measures

of the compound action potential in isolated rat optic nerves. In the neuronal processes at inner plexiform layer (IPL) of rat retinal slices, membrane depolarization by high K^+ Ringer induced a robust of Ca^{++} influx that is mediated mainly by L-type Ca^{++} channel. This Ca^{++} influx was suppressed in a dose-dependent manner by brimonidine or other alpha-2 receptor agonists. Application of NMDA to the rabbit retina increased the tonic firing rate of action potentials (APs) and decreased AP amplitude (excitotoxicity). This NMDA-induced excitotoxicity was blocked in a dose-dependent manner by memantine, a NMDA channel blocker, without affecting normal light signaling. Experimental ischemic insult to isolated rat optic nerve caused an irreversible reduction of nerve function (compound action potential). Memantine treatment was associated with preservation of nerve function following experimental ischemia.
Conclusion: Brimonidine may prevent RGC injury by preventing abnormal elevation of cytosolic free Ca^{++} either in RGCs, in their presynaptic processes, or both. Memantine may protect RGCs under disease conditions by preventing intracellular Ca^{++} overload at both dendro-somatic and axonal compartments of RGCs.

Friday, July 20, 2007

8.30-9.15 a.m.

B5-01 MECHANISMS OF ANGLE-CLOSURE
R. Ritch
New York, NY, USA

Objective: To describe the common mechanisms of angle-closure.
Main Message: The angle closure disorders are characterized by iridotrabecular apposition, which may lead to trabecular dysfunction, peripheral anterior synechiae, elevated IOP, glaucomatous optic neuropathy, and blindness. Angle-closure can be caused by one or a combination of abnormalities in the relative or absolute sizes or positions of anterior segment structures or abnormal forces in the posterior segment that may alter the anatomy of the anterior segment. Blockage of the trabecular meshwork can be caused by forces acting at four successive anatomic levels (Ritch 4-Point Classification Scheme): the iris (most commonly, pupillary block), the ciliary body (most commonly, plateau iris), the lens (phacomorphic glaucoma), and vectors posterior to the lens (malignant glaucoma). This classification facilitates understanding of the various mechanisms and appropriate treatment. Each level of block may have a component of each of the levels preceding it and in some patients multiple mechanisms play a role. The appropriate treatment becomes more complex for each level of block, as each level may also require the treatments for lower levels of block. Gonioscopy is the key to recognizing, understanding, and treating angle-closure. Indentation gonioscopy is the only way to determine if iridotrabecular contact is appositional or synechial and is the preferred method. Anterior segment imaging has improved our understanding of the pathophysiology, diagnosis, and treatment of angle-closure. Slit-lamp optical coherence tomography offers the potential for viewing the anterior chamber angle without contact and with the patient in the sitting position.
Conclusions: 1. The major mechanisms of angle closure are pupillary block, plateau iris, lens-induced angle-closure, and malignant glaucoma; 2. Indentation gonioscopy in a totally dark room is necessary for accurate diagnosis and treatment; 3. Treatment for angle-closure originating at each anatomic level going from anterior to posterior usually involves applying the treatments applicable to each to the more anterior levels in addition to that appropriate for the level at issue.

B5-02 WHAT IS WRONG WITH ANGLE ASSESSMENT
D. Friedman
Baltimore, MD, USA

Objective: To review current methods of assessing the anterior chamber angle.
Main Message: The main approaches to angle assessment in current practice are gonioscopy, Scheimpflug technologies, ultrasound biomicroscopy and anterior segment optical coherence tomography. Each of these has strengths and weaknesses and these will be reviewed.
Conclusion: Anterior chamber angle assessment is a crucial part of glaucoma diagnosis and is not performed routinely. Current methods of assessing the angle each have strengths and weaknesses. Longitudinal data are needed to determine what angle findings predict poor outcomes.

B5-03 MECHANISMS OF ANGLE CLOSURE: DO WE HAVE IT ALL WRONG?
H. Quigley
Baltimore, MD, USA

Objective: To suggest physiological mechanisms for angle closure.
Main Message: Small eyes are more likely to get angle closure (AC) and Chinese persons are five times more likely than Europeans or Africans to have AC. Yet, Chinese populations do not have proportionately more persons with small eyes compared to European populations. Therefore, anatomy can't explain the epidemiology. Gonioscopy fails to separate those with iridotrabecular contact from those with AC and ACG, and 10 persons have narrow looking angles for every person who gets ACG. So, gonioscopy is an anatomic method in a disorder that occurs for physiological reasons. Those narrow-angle eyes that will suffer AC become narrower in the dark than those that have not developed AC. One physiological behavior that contributes to AC, is the ability of vitreous humor to transmit fluid. It is conceivable that some persons have low vitreous fluid conductivity. When a transient difference in pressure across the vitreous happens, the vitreous collapses and develops even poorer conductivity, leading to a vicious cycle. The vitreous moves forward, flattening the anterior chamber. This is the actual mechanism of malignant glaucoma, not 'misdirection of aqueous' – which is physiologically impossible. If aqueous could move behind the vitreous gel, it would move right back just as easily. Eyes with typical AC may have poor vitreous conductivity as a contributing feature. Choroidal expansion is known to cause AC – after exposure to some. Drugs (topiramate, sulfa, Flomax), vascular occlusions, retinal surgery, and PRP. Very little overall choroidal thickening raises IOP and intensifies AC. Choroidal expansion has been documented in malignant glaucoma. Surgeons experience this during cataract surgery – the phenomenon known as positive pressure. It is likely that another feature of the eye that contributes to increased pupil resistance and AC disease in narrow eyes is a greater than average tendency for the choroid to expand.

Conclusions: 1. Physiological as well as anatomical features explain why some smaller eyes develop AC and ACG; 2. These mechanisms suggest new predictive tests for AC; 3. Treatments to shrink the choroid or increase vitreous fluid conductivity would be excellent adjuncts in primary and secondary AC.

B5-04 EARLY DETECTION AND TREATMENT OF PRIMARY ANGLE CLOSURE IN MONGOLIA
W. Nolan
London, UK

Objective: A programme of research focusing on primary angle closure glaucoma (PACG) has been running in Mongolia since 1991. This has consisted of a series of studies with the ultimate objective of determining whether it is possible to prevent blindness due to PACG in East Asia.
Main message: A population based glaucoma survey found that PACG was 0.8% and equivalent to that of POAG. The majority of cases were asymptomatic.
Three year follow up of laser iridotomy treated PACG and PAC cases from the survey showed that iridotomy was effective in controlling IOP in 55% (15/27) of eyes with an elevated IOP at the time of treatment and that the angle width significantly increased. The main factor predicting a favorable response to iridotomy was the absence of glaucomatous optic disc damage. A risk factor for angle closure in this and other populations is a shallow central anterior chamber depth (ACD). This led to the hypothesis that A-scan methods of measuring ACD could be used as a screening tool for the early detection of individuals at risk of PACG. This culminated in the setting up of a randomized controlled trial of screening for angle closure. To the trial, 4725 individuals were recruited from urban and rural sites within Mongolia. Six years later the cohort was re-examined to determine the incidence of PACG. Secondary outcomes included longitudinal changes in lens opacity grading and association with iridotomy.
Conclusions: 1. PACG is a common and visually destructive type of glaucoma in Mongolia; 2. The effect of laser iridotomy on IOP and angle configuration supports pupil-block as the predominant angle closure mechanism in this population; 3. Treatment with iridotomy is more successful in PAC patients than in those with established glaucoma; 4. Data analysis of the primary outcome of an RCT of screening for angle closure is underway.

B5-05 WHAT DO WE LEARN FROM THE LIWAN EYE STUDY?
M. He
New York, NY, USA

Objective: To describe the major findings of a population-based study in Liwan District, Guangzhou, mainland China. A special consideration is given to the implications of the study findings on a better understanding of angle closure in Chinese people.
Main message: Primary open angle glaucoma (POAG) is more common than angle closure glaucoma (PACG) in this southern Chinese population. The age-adjust rate of POAG is similar to that found in European-derived population and PACG rate is similar to those reported in Chinese Singaporeans. Ten percent of adult Chinese had gonioscopically narrow angles. Laser peripheral iridotomy results in a significant increase of the angle width but one-fifth of eyes had residual angle closure after the prophylactic treatment. UBM study confirms that the residual angle closure is associated with smaller anterior chamber angle dimensions, a thicker and anterior inserted iris.
Conclusions: POAG is more common in Chinese although PACG is more visually destructive. Pupil block appears to be the predominant mechanism in 80% of narrow angle eyes in which laser prophylactic treatment is able to open the angles. However, a longer term, prospective study with larger sample size is required to determine if the risks of PAC glaucoma and other pathological sequelae are reduced after prophylactic treatment, and to investigate the risk-benefit ratio prior to recommending wide-spread use in this population.

B5-06 WHERE TO FROM HERE
T. Aung
Singapore

Objective: To review future directions in angle closure glaucoma (ACG) research.
Main Message: Recent epidemiological studies have provided new information about ACG prevalence and risk factors. Research into mechanisms of angle closure will focus on the role of non pupil block mechanisms. Surgical and laser trials for ACG are being conducted that will evaluate the role of lens extraction, prophylactic laser iridotomy and iridoplasty. Recent advances in imaging have led to more objective ways of defining the angle and raised the potential using these instruments in screening. Genetic studies are also being performed to determine the genetic basis of the condition.
Conclusion: The latest directions in PACG research will be summarized.

09.15-10.00 a.m.

B6-01 WHAT HAVE WE LEARNED IN THE LAB ABOUT WOUND HEALING?
P.T. Khaw
London, UK

Objective: To outline how laboratory research has helped us understand healing after trabeculectomy.
Main message: There are many critical components of wound healing including clotting, inflammatory cells and mediators, growth factors, fibroblasts and matrix. These can be targeted to prevent scarring.
Conclusions: A basic understanding of the processes involved in wound healing helps us to develop better methods and treatments to control scarring and improve success after glaucoma filtration surgery.

B6-02 WOUND HEALING AND LOCATION
T. Wong
Singapore

Main message: The site at which wound healing occurs after glaucoma filtration surgery remains the ultimate barrier to achieving long-term success in IOP control in our patients. The wound healing response following filtering surgery is complicated by the introduction of aqueous humour to the subconjunctival space. TGF beta is the commonest growth factor secreted in the aqueous and is also responsible for the scarring response. Local Tenon's fibroblasts re-

spond to these growth factors and are the prime instigators of wound healing events. From clinical observations, bleb failure results from a gradual contraction of the subconjunctival space that allows aqueous to infiltrate, with occlusion of the sclerostomy site by fibrotic tissue and scar contraction. The wound healing response is most aggressive over the drainage site, which leads to the suggestion that components of the aqueous are responsible for perpetuating the healing response long after the initial trauma. The talk will focus the factors that influence the local wound healing response both clinical and cellular.

B6-03 IMPLICATIONS OF THE MODULATION OF WOUND HEALING TO CLINICAL PRACTICE

J. Crowston
Melbourne, Australia

Main message: Excess scar formation at the Tenon's-episcleral facia interface after trabeculectomy obstructs aqueous humor outflow and results in inadequate intraocular pressure lowering. Intra- and postoperative antifibrosis therapies are used widely to modulate the healing response and prevent excess scar formation. This not only maintains bleb survival but also permits attainment of low target pressures. As a result, antifibrosis therapy should be considered in most patients undergoing therapy. Antifibrosis therapy in particular mitomycin-C, has been associated with an increase in late post-operative complications including hypotony, bleb leak and endophthalmitis. Clinical practice should aim to prevent these complications, which largely result from excess inhibition of wound healing. A detailed knowledge of the risks and benefits of antifibrosis treatments, combined with careful preoperative risk factor assessment are recommended. Antifibrosis treatment should be titrated against the estimated risk of post operative scaring. Modern trabeculectomy techniques minimize the risks of over filtration and the development of thin avascular blebs. These include the use of laser suture lysis, releasable or adjustable sutures as well as a large conjunctival dissection and treatment area. In the post-operative period, further antifibrosis treatment may be administered where signs of active scar formation are present.
Conclusions: 1. Antifibrosis therapy improves the outcome of trabeculectomy in patients at risk of excess postoperative scar formation; 2. Antifibrosis therapy should be titrated against the estimated risk of postoperative scar formation; 3. Adoption of modern trabeculectomy techniques should be employed to minimize the risk of overfiltration and the development of thin-walled avascular blebs.

B6-04 WHAT IS INVOLVED IN TRANSLATING WOUND HEALING RESEARCH INTO CLINICAL PRACTICE?

P. Palmberg
Miami, FL, USA

Objective: To detail how the use of an anti-metabolite in filtering surgery was introduced into world wide clinical practice.
Main message: Rich Parrish's idea for a project for his research fellowship was dull. He planned to photograph failing blebs. Meanwhile, in our institution in 1981, Mark Blumenkranz had been studying 21 different compounds in fibroblast tissue culture and some of them inside rabbit eyes to see if they could prevent proliferative vitreoretinopathy without harming vital structures. Mark suggested to Rich that he try using subconjunctival 5-FU to prevent fibrosis in filtering surgery. The 5-mg dose and plan for 21 injections over two weeks were derived from the *in vitro* and animal work. Attempts in rabbits and cats failed, but it worked in one monkey. Then a one-eyed aphake presented with a Ta 50 and recent failed surgery, and on May 11, 1982, 5-FU was used successfully in a repeat trabeculectomy, and then with IRB approval in 150 other patients. The initial reports were greeted with sharply worded denunciation, and the first grant application received an insulting priority score. (The naysayers, however, rushed to confirm the findings.) An NIH sponsored multi-center clinical trial headed by Assistant Professor Richard Parrish yielded five-year outcomes that established the greater efficacy and side effects of the treatment. Then the work began. It took a decade for us and our former Fellows, and others, to speak, publish, tutor, travel to teach and also to refine the technique, so that it could be adopted into practice. The same long process occurred for Mitomycin, first used by CC Chen in 1981.
Conclusion: Radical advances require a rationale, stepwise ethical introduction, testing and refinement to improve efficacy and safety, and perserverence.

B6-05 POSTOPERATIVE ASSESSMENT OF GLAUCOMA FILTERING BLEBS

T. Wells
Wellington, New Zealand

Objective: To describe the clinical and research applications of bleb assessment, including implications for morphologic appearances and imaging results.
Main message: The bleb becomes the functional component of most glaucoma filtering surgery and is the main determinant of long term surgical success and complications. For glaucoma filtering bleb assessment a variety of vascularity and morphology appearances and parameters may be recorded clinically, with implications for bleb survival and complications. Several bleb grading systems exist for encoding clinical appearance into numeric data for later analysis. Bleb imaging may be performed by several techniques including photography, optical coherence tomography, and confocal microscopy.
Conclusions: 1. Bleb morphology is intricately linked with glaucoma filtering surgery outcomes; 2. A variety of clinical and imaging techniques are able to record and analyse characteristics of glaucoma filtering blebs; 3. Established bleb grading systems such as the Moorfields Bleb Grading System are applicable to both clinical recording and photographic grading; 4. More sophisticated grading systems separate morphology assessments from vascularity assessments, and can describe variance of these parameters over different areas of the bleb; 5. Several bleb signs carry implications for long term bleb-related complications; 6. Currently little published information is available regarding the ability of newer and more detailed bleb assessment findings to guide early postoperative wound healing modification; 7. New imaging technologies can give extra information about substructure of glaucoma blebs but clinical application of this information has not yet been established.

LASER SESSIONS

Saturday, July 21, 2007

10.30 – 12.00 a.m.

L1+2-01 MEDICAL TREATMENT VERSUS LASER TREATMENT
K. Singh
Stanford, CA, USA

Objective: To summarize the relative merits of laser trabeculoplasty versus medical therapy for the initial treatment of primary open angle glaucoma.
Main Message: There has been renewed interest in the treatment of newly diagnosed glaucoma with laser trabeculoplasty in recent years. The IOP lowering efficacy, safety, tolerability and cost of this treatment option versus medical therapy may vary depending upon the population being studied. Compliance with the various therapies should also not be overlooked. One must consider the 'quality' of IOP lowering with the various treatment modalities which incorporates diurnal and nocturnal efficacy. Finally, one must also account for the fact that patients may mistakenly believe that laser trabeculoplasty is curative when in fact it's effect is only temporary with significant variability in response to therapy.
Conclusion: While laser trabeculoplasty may be a viable initial therapeutic option for some patients, one must weigh the merits of this procedure relative to other treatment options, particularly medical therapy, for the initial treatment of glaucoma. There is no therapeutic alternative that is ideal for all patients newly diagnosed with primary open angle glaucoma.

L1+2-02 LASER TREATMENT FIRST
Y.M. Buys
Toronto, Canada

Objective: To provide evidence for laser trabeculoplasty as first line therapy for open angle glaucoma (OAG).
Main message: The Glaucoma Laser Trial concluded that ALT could be considered for first-line therapy in OAG. This concept, however, was not uniformly adopted, mostly due to concerns regarding permanent structural damage caused by this laser. SLT offers similar IOP reduction without associated fibrosis and scarring. Laser trabeculoplasty offers several advantages over medications including side effects, compliance, and reduced patient costs, all of which contribute to improved quality of life. Given that SLT is a safe, noninvasive and effective treatment modality for OAG and offers several advantages over medications it is time to change the current paradigm of glaucoma therapy to lasers first.
Conclusions: 1. Laser trabeculoplasty is a safe and effective therapy for OAG; 2. Laser trabeculoplasty has several advantages over medical therapy (fewer side effects, compliance, reduced patient cost, quality of life) making this modality a good choice for first line therapy for OAG.

L1+2-03 MEDICAL TREATMENT FIRST
S.A. Gandolfi
Parma, Italy

Main Message: The most recent randomized clinical trials suggest that the progression of glaucomatous optic neuropathy can be significantly lowered if an 'aggressive' approach on IOP is adopted. Thirty to 40% decrease of baseline IOP is consistently reported as the necessary target. Such a decrease can be obtained by a treatment option based upon topical therapy in (at least theoretically) every single phenotype of adult glaucoma. In particular, the recent availability of fixed combination(s) offers a better feasability profile for multiple drugs schedules. The talk will focus on (a) the scientific evidence for a vigorous IOP-lowering approach, (b) strategies for optimizing combination therapy and (c) description of those glaucoma phenotypes where laser treatment will be less effective (if not controindicated)

L1+2-04 THE ROLE OF CYCLODESTRUCTION IN THE THIRD WORLD
H. Quigley
Baltimore, MD, USA

Objective: To discuss existing information and speculation about the use of ciliodestruction in developing countries for glaucoma.
Main Message: Eyedrop treatment is not practical for glaucoma treatment in much of the world, due to a variety of issues including cost, availability, and cultural acceptance. Surgery might be offered as an alternative, but it has serious side effects, and there is no evidence that trabeculectomy or other operations in this setting produce a better overall outcome than the natural history of glaucoma (either open angle or angle closure). In fact, since the progression rate of both major forms of glaucoma indicates that the majority of those with defined disease will not ever become blind without treatment, one approach would be to select those likely to be blind within their life and offer them surgery if its complications can be shown to be less than the natural history rate of vision loss – and if its practicality and acceptance in various populations can be assured. Complications of surgery include cataract and since access to successful surgery for that may not exist in many settings, this is not an acceptable side effect unless lens implant surgery is also available. Filtering surgery has been shown to be at least feasible and to have defined outcome in the developing world (Tanzania), but skills and equipment not generally available. Diode ciliodestruction is a reasonable alternative surgery, requiring lower skill, and lower cost than trabeculectomy, depending upon the volume of patients to be treated with the initial fixed cost of purchase of the laser. No controlled clinical trial of diode ciliary body treatment has been conducted in the developing world, though some case series exist. Kaushik *et al*. (India) showed the diode lowers IOP, but the details of therapy must be reconsidered if primary glaucomas are to be treated compared to secondary or 'refractory' glaucoma. Lai *et al*. (Hong Kong) found that diode lowers IOP in medically uncontrolled PACG, but most patients were back on eyedrops by 18 months – clearly not acceptable if the aim is

to lower IOP instead of topical therapy. Egbert *et al*. (Ghana) found that diode produced a 20% lowering of IOP in half of those treated, but 1/4 had a decrease in vision and an atonic pupil was a frequent complication, which is very much more a problem in rural populations. It may be reasonable to consider laser trabeculoplasty as an alternative, since it has fewer complications, but less IOP lowering, could be used in a broad spectrum of OAG than diode. However, it requires a slit lamp, a laser and excellent gonioscopic skills.
Conclusions: 1. There is insufficient evidence to recommend diode ciliodestruction for treatment of persons in developing countries.

L1+2-05 THERE IS NO ROLE FOR CYCLODESTRUCTION IN THE 3RD WORLD
K. Ben Amor
Tunis, Tunesia

Objective: To demonstrate that cyclodestruction has exactly the same indications than in developed countries and can not be extended to treat seeing eyes in developing countries.
Main Message: Although cyclodestruction looks as an attractive alternative to other procedures in 3rd world countries, the reality of glaucoma deserves more attention in this countries (higher prevalence, earlier onset, advanced function defects in first visit). In addition to the relatively high cost of the Diode Laser machines, the technique of cyclodestruction is not very secure (difficulties in ciliary body localization, inflammatory reactions, extensive tissue damage, late phtysis) and can not be left in technicians hands, specially for seeing patients. But the major difficulty with this procedure remains the dose response relation, especially in pigmented eyes. The few published results shows that only two third of eyes achieve an IOP less than 22 mmHg after 1.75 retreatments , and results are worse in congenital glaucoma and young patients. Finally, there is no publication on long term effect of cyclodestruction on function of seeing eyes.
Conclusions: Cyclodestruction, in addition to its unproven effectiveness, doesn't free the glaucoma still seeing patient from medical follow up, witch is the real problem in developing countries, due to lack of medical human resources. Its extension as a primary glaucoma procedure treatment for seeing eyes constitutes a dangerous shortcut and may lead to neglect the real solutions and actions to be taken to face the glaucoma challenge in developing countries

L1+2-06 ROLE OF CYCLODESTRUCTION IN DEVELOPED WORLD
J. Thygesen
Copenhagen, Denmark

Objective: To control the IOP patients with intractable glaucoma by decreasing aqueous humour production by destroying part of the ciliary body. Various cyclodestructive procedures are available: 1. Cyclocryotherapy. 2. Cyclophotocoagulation: a. Transscleral cyclophotocoagulation with Nd:YAG (1064 nm); b. Transscleral cyclophotocoagulation semiconductor diode laser (810 nm); c. Endoscopic cyclophotocoagulation with argon or diode laser; d. Transpupillary cyclophotocoagulation with argon or diode laser.
Main Message: Transscleral cyclophotocoagulation, as with other cyclodestructive procedures, is typically reserved for patients with refractory forms of glaucoma, such as glaucomas in aphakia or pseudophakia, neovascular glaucoma, glaucomas associated with inflammation, and eyes with multiple failed filtering procedures or following penetrating keratoplasty. Cyclophotocoagulation can also be useful for patients whose general medical condition will prevent incisional surgery and to those who refuse traditional filtering operation or placement of a drainage implant. Some surgeons only treat patients with minimal useful vision or no visual potential and for pain relief from intractable glaucoma. It has also been evaluated as a primary surgical treatment in developing countries where conventional glaucoma therapy is not available, with inconclusive results.
Comparisons of transscleral cyclophotocoagulation to cyclocryotherapy in humans have revealed insignificant differences in IOP responses, but *less* tissue destruction and *fewer* complications with the cyclophotocoagulation treatments, therefore transscleral cyclophotocoagulation is now the cyclodestructive procedure of choice. Results differ somewhat according to the type of glaucoma. In general, patients with glaucoma in aphakia or pseudophakia have more favourable results, and those with neovascular glaucoma tend to do less well. Patients with glaucoma following penetrating keratoplasty have good lap response to Nd:YAG cyclophotocoagulation, although graft failure is a problem in some cases. The individual surgeon must decide which procedure to use, depending on the availability of the instruments and the lasers. The overall success rate in controlling the IOP is 60-80% in 2 years. Complications: Persistent inflammation, loss of best corrected visual acuity, hypotony and phthisis; Isolated reports mention presumed sympathetic ophthalmia.
Conclusion: Transscleral cyclophotocoagulation is the cyclodestructive procedure of choice for patients with refractory forms of glaucoma and an alternative to drainage implants.

L1+2-07 ENDOCYCLODESTRUCTION: IS THERE A PLACE FOR IT?
S. Lin
San Francisco, CA, USA

Objective: A review of the literature on endoscopic cyclophotocoagulation (ECP) was performed to assess the utility and safety of endoscopic cyclophotocoagulation for the treatment of various forms of glaucoma.
Main Message: There is strong evidence that ECP is an effective and relatively safe procedure for the treatment of refractory glaucomas. There may be increased risk for complications in pediatric cases. The usefulness of ECP combined with phacoemulsification cataract extraction has been addressed in a recent study, with the results pending publication.
Conclusion: ECP is an effective treatment for refractory glaucoma. Severe complications are uncommon, found mostly pediatric cases.

L1+2-08 ALT-SLT OVERVIEW
R. Ritch
New York, NY, USA

Objective: To compare the results of argon and selective laser trabeculoplasty in open-angle glaucomas.
Main Message: Argon laser trabeculoplasty is initially effective in about 85% of treated POAG eyes with a mean IOP reduction of 6 to 9 mmHg (20 -30%). Most investigators report a five year success rate of about 50%, with an attrition

rate of 6% to 10% per year. It is less successful in eyes with no trabecular pigmentation. Patients over age 40 respond better than younger ones, except for those with pigmentary glaucoma, where the opposite holds. Exfoliation syndrome responds well to ALT with a greater mean IOP drop compared to POAG. ALT is ineffective in patients with uveitis, angle-recession, high myopia, and eyes in which progression of PAS is a threat. Selective laser trabeculoplasty targets pigmented trabecular cells while sparing adjacent cells and tissues from collateral thermal damage. It is performed with a 532 nm frequency doubled, Q-switched Nd:YAG laser beam using low energy (0.4 mJ to 1.2 mJ), short pulse duration (approx. 3 ns), and a large spot size (400 µm), achieving selective targeting of pigmented cells and less dissipation of energy. Unlike ALT, SLT does not produce scarring of the TM. Disruption or killing of pigmented TM cells alone appears to induce a response that results in a reduction of IOP after SLT. SLT seems to be as effective as ALT in patients with open angle glaucoma on maximally tolerated treatment in short-term and some long-term success evaluations. It is as effective in both pseudophakic and phakic patients. Overall efficacy of SLT is less dependent than ALT on TM pigmentation. However, for both SLT and ALT, overall greater IOP reductions are probably greater in more pigmented meshwork. The results of SLT in glaucomas other than POAG require further study.
Conclusions: 1. ALT and SLT are both effective in POAG; 2. SLT has the theoretical advantage of repeatability, but this needs further study; 3. ALT is preferable in exfoliation syndrome and in younger patients with pigmentary glaucoma; 4. SLT is preferable in older patients with pigmentary glaucoma
5. ALT does not work in younger patients, high myopia, and uveitis; 6. Further study is needed regarding the use of SLT in secondary glaucomas.

L1+2-09 ARGON LASER PERIPHERAL IRIDOPLASTY (ALPI) – INDICATIONS
C. Tham

Objective: To discuss the main indications for ALPI, a laser technique that involves the application of low-energy contraction laser burns on the peripheral iris to mechanically pull open appositionally-closed drainage angles for intraocular pressure control.
Main message: Currently, the clinical indications for ALPI include acute angle closure (primary and some secondary), chronic angle closure (with or without glaucomatous changes), plateau iris syndrome, angle closure related to size or position of the lens, and as an adjunct to laser trabeculoplasty. Contraindications for ALPI will also be presented in this lecture.
Conclusion: ALPI is a useful technique in various conditions with raised intraocular pressure secondary to appositional angle closure. Judicious use will minimize possible complications.

L1+2-10 PROFILACTIC IRIDOTOMY: WHEN?
R. Thomas
Hyderabad, India

Main Message: The decision to perform LPI requires knowledge of the natural history of the various types of angle closure disease as well as the risk and consequences of progression weighed up against the benefits and risks of a 'simple' intervention. The risk benefit ratios are such that there is reasonable consensus for LPI in acute angle closure glaucoma, 'fellow eyes', primary angle closure glaucoma and primary angle closure. Primary angle closure suspects, defined as non visibility of the trabecular meshwork for more than 180 degrees under specified testing conditions constitute up to 8% of certain populations, and have a benign course. While approximately 22% of such cases progress to angle closure over 5 years, progression to glaucoma or blindness is very rare. Accordingly, the use of routine LPI for such cases is far more contentious and should be reserved for the minority at high risk of an acute attack or glaucoma. Of greater importance is the detection of early primary angle closure and primary angle closure glaucoma, as LPI in such eyes actually prevents blindness. Even in regions with a higher prevalence of closure the only viable strategy to detect such cases is to perform a comprehensive eye examination, including gonioscopy, on every clinic patient

An expert doesn't know any more than you do.
He is just better organized and uses powerpoint-presentations.

Stephen Brunton, M.D.

CLOSING SESSION

WATCHING GANGLION CELLS DIE

J. Crowston
Melbourne, Australia

Objective: To discuss the feasibility and advantages derived from *in-vivo* imaging of retinal ganglion cell death in glaucoma.
Main Message: Pilot work from a number of groups have used different approaches to demonstrate the feasibility of *in-vivo* imaging of retinal ganglion cell loss in rodent glaucoma models. the potential of transferring this technology into humans will be discussed.
Conclusion: The successful development of safe, robust and reproducible systems that permit *In-vivo* imaging of retinal ganglion cell death *in-vivo* will likely have a significant impact on glaucoma diagnosis and monitoring the response to treatment

STEM CELL TRANSPLANTATION FOR GLAUCOMA

K. Martin
Cambridge, UK

Objective: To consider the issues involved in the possible future use of stem cell and progenitor cell transplantation for the treatment of glaucoma.
Main Message: Stem cell transplantation could theoretically be beneficial in glaucoma either by replacing retinal ganglion cells (RGC) lost to the disease or by a neuroprotective effect of transplanted cells on surviving RGC. As re-establishing functional connections between transplanted cells and the appropriate target fields in the brain presents formidable challenges, demonstration of a neuroprotective effect of transplanted cells may be a more realistic initial goal. Such a protective effect would require transplanted cells to survive, function and presumably integrate within the host retina without compromising its function. Several promising candidate cell types for transplantation exist, including adult retina-derived cells and mesenchymal stem cells. These cells can survive and differentiate in animal models of glaucoma, and modulation of the host environment seems to facilitate integration.
Conclusions: 1. Successful stem cell transplantation for glaucoma will require control of the survival, migration, differentiation and integration of transplanted cells; 2.The mechanisms involved in these processes are gradually being elucidated and their modulation can be explored in retinal explant cultures with the most promising approaches then taken forward into animal models of glaucoma; 3.Replacement of RGC is the long term goal, but in the short term it is important to establish if cellular transplantation therapy has neuroprotective potential without unacceptable side effects.

THE FUTURE OF GLAUCOMA DROPS: SYSTEMIC DISEASE NEEDS SYSTEMIC TREATMENT

N. Gupta
Toronto, Canada

Objective: To review evidence that in glaucoma, multiple body systems may contribute to the insult and survival of retinal ganglion cells in the eye, and to consider the relevance of systemic treatments to help prevent blindness from glaucoma.
Main message: Vision loss in glaucoma may be associated with elevated intraocular pressure. Current therapies to slow glaucomatous damage are aimed at lowering intraocular pressure in the eye. There are many patients that continue to lose sight in spite of intraocular pressure control. In glaucoma, dysfunction and death of retinal ganglion cells in the eye is likely a result of local ocular insults such as elevated intraocular pressure, in addition to injuries arising from multiple body systems. Established and emerging factors that contribute to glaucoma damage come from the central nervous system, cardiovascular, respiratory, endocrine and immune systems. In this context, therapeutic strategies to target disturbances and enhance system function are relevant to preventing injury and vision loss in glaucoma.
Conclusions: Multiple systemic factors may contribute to retinal ganglion cell disease in glaucoma. Future strategies to identify and target relevant systemic factors involved in glaucomatous injury may help to enhance retinal ganglion cell survival. In addition to glaucoma drops, an individualized and comprehensive medical approach to the glaucoma patient may provide novel opportunities to prevent vision loss.

THE FUTURE OF GLAUCOMA DROPS: THE ONGOING PROBLEM OF ADMINISTERING EYE DROPS

P. Kaufman
Madison, WI, USA

Main Message: Eyedrops are the classical and currently preferred method for administration of drugs to lower IOP, and indeed for nearly all anterior segment indications. However, their ability to deliver drugs to the posterior segment, and the necessity for the patient to be part of the delivery system, are weaknesses, especially if we envision posterior segment therapies for glaucoma. This presentation will deal with future therapeutic approaches that are local do not involve either eyedrops or the patient in the delivery process.

DO DRUGS WORK AT NIGHT?

A. Sit
Rochester, MN, USA

Objective: To discuss the circadian variations in efficacy of glaucoma medications.
Main message: Recent research has indicated that the efficacy of glaucoma medications varies with the circadian rhythm. Prostaglandin analogues appear to provide good IOP reduction throughout the 24-hour period. In contrast, once a day timolol provides good IOP reduction during the day but little IOP reduction during the nocturnal period. Brimonidine and dorzolamide appear to have some reduction of IOP during the nocturnal period, but less than with prostaglandin analogues. These differences in IOP reduction pattern may indicate benefits of certain medications beyond the reduction of IOP during typical office hours. Twenty-four hour IOP reduction results in more consistent IOP with lower peaks.

Although the clinical significance of reducing IOP during the nocturnal period is still unclear, there are good reasons to believe that it may be beneficial. Differences in 24-hour efficacy may influence the selection of medications for glaucoma treatment.

Conclusions: 1. Different types of medication can have very different efficacy profiles during the nocturnal period despite similar IOP lowering during the diurnal period; 2. Prostaglandin analogues appear to have the most consistent 24-hour IOP reduction; 3. Once a day timolol appears to have little efficacy at night.

SYMPOSIA

Wednesday, July 18, 2007

10.00-11.00 a.m.

S01 DEBATE – HEALTH ECONOMICS 1: QUALITY OF LIFE
J. Burr (chair), R. Mills, R. Varma, A. Viswanathan, R. Parrish H. Quigley, A. Tuulonen (supervising chairs)

Participants: S. Mansberger, F. Medeiros, G. Kobelt, S. Kymes, R. Parrish, A. Viswanathan, R. Mills, P. Healey, R. George, K. Frick, M. Jofre-Bonet, H. Mishima, R. Varma, J. Burr, J. Thygesen, C. Traverso, A. Heijl, A. Azuara Blanco, R. Hitchings, A. Pleil, J. Walt, P. Buchholz, J. Doyle, M. Brown (preparation only)

Description: Economic evaluation is the comparative analysis of alternative courses of action in terms of their costs (resource use) and benefits (health effects). In a scenario where resources are limited the patients' perception of health outcome is of fundamental importance in any assessment of the benefits of an intervention.
Statement 1: Patient reported health can be described in terms of the WHO International Classification of Functioning, Disability and Health (ICF) framework, in which three types of health outcome are measured: Impairment, Activity Limitation, and Participation Restriction.
Statement 2: Patient reported health can be measured by separate scores across the health outcomes captured by a HRQOL instrument, i.e. an individual health profile, or valued via preference (utility) based measure of alternative health states.
Specifically the panel will discuss: 1. What do we mean by HRQOL, why is it important and how can it be measured?; 2. Do recent randomised controlled trials adequate assess the value of alternative treatments from a patient perspective?; 3. Is there a relationship between functional status (driving, activities of daily living, etc.) and visual acuity and visual field loss?; 4. How do patients with glaucoma value their health state?

S02 GLAUCOMA PATIENT ORGANIZATIONS
I. Goldberg (chair), G. Lambrou (chair), R. Ritch (chair)

Description: Seminar 'AIGPO: TAKING STOCK AND MOVING ON'. The seminar should be set-up so as to elicit strong interaction with the audience: a short presentation from the speaker setting the stage, then long open discussion between panel members and with the audience.
Seminar outline: 1.GPO census: Do we need one and how do we do it?; 2. Is there a need for an AIGPO?; 3. Relations between National / Regional GPOs and AIGPO: The subsidiarity principle; 4. Relations between the AIGPO and the AIGS; 5. 'Power to the Patients!' or How to make sure their doctors listen to what they have to say; 6. Money Matters: Where to find it and how to spend it.

4.15-5.15 p.m.

S03 MOLECULAR BIOLOGY OF GLAUCOMA
M. Rosario Hernandez (chair), J Flammer (chair), Terete Borras, Megumi Honjo, Hidenobu Tanihara

Description: Glaucoma is a complex disease that affects the trabecular meshwork, regulation of IOP, retinal ganglion cells and the optic nerve head. In this symposium we will discuss molecular approaches to studying glaucoma. We will present the powerful tool of microarray profiling of human trabecular meshwork, optic nerve head astrocytes and lymphocytes of patients with glaucoma. Application of molecular genetics findings and the molecular based therapeutics of glaucoma will be discussed. Emerging strategies that incorporate pathway analysis and molecular interactions in the molecular signature of glaucoma may link prognosis and therapy prediction with transcriptional information of mechanism of glaucomatous damage.

S04 DEBATE – HOW EARLY SHOULD GLAUCOMA BE DETECTED
A. Heijl (chair), T. Garway-Heath, H. Lemij, F. Meideros

Description: Recently reported large randomized trials have finally proven that reduction of intraocular pressure (IOP) can reduce the progression rate of manifest glaucoma with elevated or normal IOP and reduce the incidence of glaucoma damage in patients with ocular hypertension. This might tempt us to conclude that all patients with manifest glaucoma should receive maximum treatment, and that all glaucoma suspects should be treated. This conclusion could only be correct if treatment was free from side-effects and caused no inconvenience, and if resources were unlimited. Cost and side-effect are obviously important. When we consider how early that glaucoma should be detected, we must also consider the goal of glaucoma treatment (which by EGS is formulated as avoiding loss of quality of life at affordable costs), and the impact on quality of life of the disease, and of being informed about the diagnosis. Another important fact to consider is that at least half of all patients with manifest glaucoma are undiagnosed.
Outline: 1. Detection of glaucoma at an early stage is only motivated in young patients; 2. Detection of preperimetric glaucoma should be the norm in glaucoma suspects; 3. We should devote more of our resources to careful follow-up of patients with potentially sight-threatening disease, and less of our resources to very early diagnosis; 4. We should seek to diagnose citizens with unrecognized moderately advanced or advanced glaucoma by increasing access to ophthalmic health care and through screening.

Thursday, July 19, 2007

2.00-3.00 p.m.

S05 ADVOCACY
P. Kaufman (chair), D. Grigera (chair), R. Hitchings (chair), H. Tanihara (chair)

Description: This symposium addresses the position of glaucoma as a subspecialty of ophthalmology. It assesses the relevance of our discipline to the patient, the research community and to funding agencies. Although a relatively common group of diseases the glaucoma's have a low public impact by comparison with keratorefractive and cataract surgery, age related macular degeneration and diabetes. This is largely because they has a slow course, with overlap in visual field hiding all but advanced disease, and are asymptomatic in the early and most treatable stages. Despite this the glaucoma's are responsible for much of the blindness in the world today. In order to maintain appropriate allocation of healthcare resources, it is important to improve the perception of both the public and policy makers of the visual disability from the glaucoma's and how best this can be tackled. The speakers in this symposium will look at these problems from the perspective of their geographical regions in the world.

S06 POSTER DISCUSSION 1
A. Coleman (chair), S. Gandolfi (chair)

Description: The two Poster Discussion symposia will discuss the Top-ten posters that came out of the grading by the poster committee and the subsequent visit of the posters during the WGC. Based on the discussion between the members of the poster committee and the authors the Top-three award recognitions will be selected. The recognition ceremony will be part of the Closing Session.

S07 DEBATE – PROGRESSION
B. Chauhan (chair), T. Garway Heath (chair), A. Heijl, P. Sample, L. Zangwill

Outline: 1. Clinical data on the visual field and optic disc are collected too sparsely to judge meaningful progression. *Pro:* A. Heijl, *Con:* D. Garway-Heath; 2. A diagnosis of change is necessary to make a diagnosis of glaucoma. *Pro:* L. Zangwill, *Con:* P. Sample; 3. Once a patient has abnormal visual field results, it is a waste of time to monitor optic disc progression. *Pro:* A. Heijl, *Con:* B. Chauhan. Each topic will take up 20 minutes. Each debater will have 5 minutes, leaving 10 minutes for a quick rebuttal (no slides) and audience questions and discussion. The debaters will not have a preview to their opponents' slides.

S08 DEBATE – OCULAR BLOODFLOW
S. Orgül (chair), A Harris, G Michelson, L. Schmetterer

Description: Although ocular blood flow has been recognized as a relevant factor in glaucoma, it remains difficult to implement the concept into the management of the patients, and the following issues shall be debated controversially: current technology for ocular blood flow measurement does not provide meaningful information on ocular blood flow in glaucoma; current evidence with regard to blood flow alteration in glaucoma does not deserve attention in glaucoma treatment; therapeutic modalities likely to improve ocular blood flow in glaucoma patients are not yet available. ***Statements:*** 1. Current technology for ocular blood flow measurement does not provide meaningful information on ocular blood flow in glaucoma; 2. Current evidence with regard to blood flow alteration in glaucoma does not deserve attention in glaucoma treatment; 3. Therapeutic modalities likely to improve ocular blood flow in glaucoma patients are not yet available.

S09 PEDIATRIC GLAUCOMA – THERAPY – INDICATIONS, CONTRAINDICATIONS, ADVANTAGES, DISADVANTAGES
P. Khaw (chair), A. Mandal (chair)

Participants: M. Papadopoulos, H.-Ch. Lin, A. Mandal, P. Khaw, E. Maul, J. Brandt

Description: This symposium is suitable for those interested in the care of patients with paediatric glaucoma. A panel with extensive, wide and diverse experiences of paediatric glaucoma will present a balanced view on the place of different modalities of treatment in various types of paediatric glaucoma. We will highlight technical advances including topical and oral medications and surgical methods. We will consider therapies in the context of practical constraints and different outcomes in various patient sub-groups and geographical locations. This symposium will also be a precursor to the AIGS consensus meeting on paediatric glaucoma to be held in the next year.

S10 DEBATE – HEALTH ECONOMICS PART 2: RISK
S. Mansberger (chair), F. Medeiros (chair), R. George, P. Healey

Description: Risk is an important factor in health economic models. Health economists frequently use 'risk' as part of their health economic models. We will discuss how economic models include risk into cost utility and quality of life estimates, and how risk affects the model results. Economic models need: 1. definitions of the stages of glaucoma; 2. the risk of converting to a subsequent stage of glaucoma. Health economic models require definitions of the stages (or levels) of glaucoma (such as glaucoma suspect to end-stage glaucoma). They also require estimates of the rate of change from one stage to a subsequent stage. We will discuss staging systems for glaucoma. We will also provide estimates of converting from ocular hypertension to glaucoma, and from glaucoma to later stages of glaucoma.

S11 DEBATE – FIXED COMBINATION THERAPY
C. Migdal (chair), R. Fechtner (chair), Norman Aquino, F. Gomez Goyeneche, T. Hommer, K. Singh

Description: There exist significant treatment burdens for the patient with glaucoma: medicines are costly, instillation can be inconvenient, and medications have side effects that are noticeable to the patient while the early damage of glaucoma is not! For the many patients not controlled with initial monotherapy, fixed combination medications offer potential benefits of cost savings, and a reduction in the number of drops instilled daily. However, they may not represent optimal therapy in other respects. In this panel format, several glaucoma experts will debate the pros and cons of fixed combination eye drops.
Outline: 1. Do fixed combinations work as well as the concomitant use of components?; 2. Do prostaglandin/timolol fixed combinations provide any better IOP reduction than prostaglandin alone?; 3. Can fixed combinations improve adherence with therapy?; 4. Does the loss of ability to titrate concentration and dosing schedule have a negative im-

pact on therapy?; 5. Is timolol 0.5% the best OBB for fixed combinations?

S12 BASIC RESEARCH IN GLAUCOMA SURGERY
J. Ge (chair), R. Parrish (chair)

Outline: Role ocular surface, C. Baudouin; Surgically manipulating pathways, J. Crowston; Uveoscleral outflow in glaucoma surgery, S. Melamed; What we have learned from NPGS, T. Shaarawy; Current knowledge on outflow pathways including Schlemm's canal, E. Tamm; Wound healing, T. Wong.

S13 GLAUCOMA IN ASIA
D. Lam (chair), R. Thomas (chair), Y. Kitazawa (chair)

Participants: Y. Kitazawa, N. Wang, J. Zhao, S. Chakrabarti, M. He, K. Sugiyama, M. Kook, T. Aung, R. Thomas, C. Tham, P. RojanaPongpun, D. Lam

Description: Asia is an unequally developed region with astonishing contrasts not just limited to culture and cuisine. The population numbers make glaucoma a major problem and while angle closure is the predominant type, intra-regional differences like the prevalence of NTG in Japan are noteworthy. Further, socio-economic and logistical realities demand a practical, approach to the current problem, while maintaining a research oriented, innovative eye on the future. This symposium will bring together regional clinicians and scientists who have the practical experience to highlight local issues in genetics, epidemiology, clinical spectrum, diagnosis and management of glaucoma in Asia.

Friday, July 20, 2007

2.00-3.00 p.m.

S14 PROMULGATION: TAKING CONSENSUS TO GUIDELINES FOR GLAUCOMA CARE
R.N. Weinreb (chair), M. Araie, R. Hitchings, R. Susanna, N. Wang

Description: Our management of gaucoma patients should be supported by either evidenceor consensus. Unfortunately neither are abundantly available for variousaspects of our management. The AIGS has so far obtained global Consensuson Glaucoma Diagnosis, Surgery for Open Angle Glaucoma, and Angle Closure.The Consensus on Intraocular Pressure is in progress and should be availableat the WGC. Global Guidelines on Reporting and Publishing of Glaucoma Surgerywill soon be printed. Other topics will follow in the coming years. The aimof the AIGS is to cover the whole range of Diagnosis and Treatment of Glaucoma. For the Glaucoma Societies of the AIGS it will be essential that their membersare aware of the conclusions of the consensus meetings. The AIGS will proposea system for promulgation and implementation based on the consensus resultsthat can be used by the Glaucoma Societies to inform their members and tostimulate implementation. It is well known that the mere publication of Consensusoutcomes is only the beginning. Promulgation and implementation will be necessary.The activities of the Glaucoma Societies can make a great difference forthe quality glaucoma management in their country.

S15 POSTER DISCUSSION 2
A. Coleman (chair)

Description: The two Poster Discussion symposia will discuss the Top-ten posters that came out of the grading by the poster committee and the subsequent visit of the posters during the WGC. Based on the discussion between the members of the poster committee and the authors the Top-three award recognitions will be selected. The recognition ceremony will be part of the Closing Session.

S16 DEBATE – SWAP, FDT
P. Sample (chair), J. Flanagan (chair), D. Garway Heath, C. Johnson, M. Patella, A. Heijl

Description: The idea of visual function specific perimetry for the early detection of glaucoma has been popular for many years. There are currently several commercially available visual function specific tests. This debate will consider two of these: Short-Wavelength Automated Perimetry (SWAP) and Frequency Doubling Technology (FDT).
Outline: Four questions will be debated by the expert panel: 1. SWAP and FDT should be used to monitor glaucoma suspects with normal SAP; 2. FDT should be used for routine screening for glaucoma; 3. FDT is better than SWAP for the detection of early glaucoma; 4. Selective testing with SWAP and FDT make them good for monitoring disease progression.

S17 THE IMMUNE SYSTEM IN GLAUCOMA
M. Schwartz (chair), F. Grus (chair), M. Wax

Description: As much as uncontrolled immunity can be destructive, well-controlled immunity benefits neural tissue survival and repair. Several studies provided evidence that there is a potential role of the immune system in the pathogenesis in glaucoma and that glaucoma patients suffer from alterations in their natural autoimmunity. Changes in the autoantibody profiles have been reported in glaucoma patients; up-regulations of anti-heat-shock protein antibodies (*e.g.*, HSP27), but down-regulations of immunereactivities against ocular antigens. In contrast, deficiency in adaptive immunity altogether leads to decreased neuronal survival in animal models of elevated intraocular pressure. Consistent with this contention, systemic elevation of T cells specific to retinal antigens results in an increased survival of retinal ganglion cells. It is thus suggestive that immune-based approach of immune-modulation by therapeutic vaccination, rather than immune-suppression should be a therapeutic approach for glaucoma.

S18 DEBATE – ANGLE CLOSURE AND IMAGING
P. Chew (chair), D. Friedman (chair)

Description: This debate will review the current thinking about the role of anterior segment optical coherence tomography (AS-OCT) in identifying persons with angle closure. The first debate will highlight strengths and weaknesses of gonioscopy and AS-OCT when used clinically. The second debate will cover the potential role and limitations of AS-OCT as a mass screening device. Time will be allotted for questions.

S19 DOES MYOPIA AFFECT GLAUCOMA?
S.-T. Hoh (chair), K. Singh (chair), J. Jonas, P. Mitchell

Description: The association between myopia and glaucoma is well recognized, with increased prevalence of myopia observed in patients with ocular hypertension, primary open-angle glaucoma and normal tension glaucoma. Recent evidence has suggested that the optic nerve and visual field deficits in many myopic individuals may not progress in the same manner as seen in patients with open angle glaucoma. Some investigators have also pointed out that myopic discs may be anatomically predisposed to glaucomatous progression. With myopia growing in epidemic proportions, especially in Asia, glaucoma and myopia occurring concurrently is increasingly common, resulting in diagnostic dilemmas for practicing ophthalmologists.
Outline: This symposium discusses issues relating to the association between glaucoma and myopia, the structural and visual field variations with myopia and the potential use of new imaging modalities in assessing these changes. There will also be a panel discussion regarding the impact of refractive surgery on glaucoma assessment in myopes.

S20 GLAUCOMA AS NEURODEGENERATIVE DISEASE
N. Gupta (chair), Y. Yücel (chair)

Outline: 1. Retinal ganglion cells: Injury and degeneration, K. Martin; 2. From the eye to the brain: Neural degeneration, N. Gupta; 3. Behind the eye: Mapping visual system function, R. Hawerth; 4. Clinical implications: Glaucoma as neurodegerative disease, A. Alm.

S21 DEBATE – NORMAL TENSION GLAUCOMA
Y. Kitazawa (chair), J. Flammer (chair), K.H. Park, R. Ritch, T. Yamamoto, K. Ishida

Description: This debate will center around the following statements: 1. Normal Tension Glaucoma and Primary Open Angle Glaucoma are two different diseases; 2. Lowering IOP is not the most important treatment for NTG. These two statements will be introduced briefly followed by an in depth discussion by the expert panel. The topics represent two of the most important issues in NTG. If NTG and PAOG are different diseases it may follow that treatment should also be different. Thus the conclusion on statement 1 is relevant for the discussion of statement 2.

S22 DEBATE HEALTH ECONOMICS 3: COST
G. Kobelt (chair), S. Kymes (chair), A. Azuara Blanco, K. Frick, M. Jofre-Bonet, C. Migdal, H. Mishima

Description: Glaucoma patients are elderly and present generally with visual and non-visual co-morbidities. We will discuss the issues and implications in cost-effectiveness studies of partioning vision-related utilities.
Outline: 1. Transnational and cross-cultural issues in assessment of cost and outcome advocates for a policy change frequently use costs and outcomes assessed in one country to support a recommended change in another. We will discuss whether outcome and costs are fully or partiall, transferable between nations and cultures. 2. Costs in economic evaluations depend on the perspective of a study. We will discuss how we obtain total costs (health care and other) and ensure that all are considered in decision making. 3. Influences of utility measurement in glaucoma

S23 DEBATE – OPEN ANGLE-GLAUCOMA: MEDICAL TREATMENT VERSUS LASER TRABECULOPLASTY
S. Gandolfi (chair), K. Hartleben, P. Khu, S. Best, Y. Buys, T. Krupin

Description: What is the most effect and best tolerated initial treatment of open-angle glaucoma, medical or laser treatment? Pertinent issues to answer this question include comparison of the magnitude and long-term reduction of intraocular pressure. Side effects of the treatments, costs, adherence, and quality of life are also important considerations. Does initial laser treatment alter the action of subsequent medical treatment? Do these treatments differ in possible adverse effects on future filtration surgery if this becomes necessary?

S24 SURGERY: BEYOND THE STATUS QUO
M. Aihara (chair), T. Shaarawy (chair)

Outline: I-stent: what we know, C. Traverso; Gold shunt: critical appraisal, C. Mielke; Trabectome, T. Shaarawy; Canaloplasty, I. Ahmed. *Debate:* Ex-PRESS versus trabeculectomy. *Pro:* E. Dahan, A. Mermoud, *Con:* P. Khaw, R. Fechtner.

We are all replaceable, usually by people of lesser quality.

Mark Weissman, M.D.

COURSES

Wednesday, July 18, 2007

4.15-5.15 p.m.

CO-O1 GLAUCOMA EPIDEMIOLOGY: PREVALENCE AND DIAGNOSIS
D. Friedman (chair), P. Mitchell, H. Quigley, T.-Y. Wong

Description: This course will run through key findings in population-based research on glaucoma. The first speaker will review definitions and nomenclature. This will be followed by detailed discussions of open-angle and angle-closure glaucoma prevalence and risk factors. Finally, past research on screening for glaucoma will be reviewed and a discussion of future screening strategies will be presented. Time will be allotted for questions and answers.

CO-02 DRIVING WITH GLAUCOMA
A. Viswanathan (chair), P. Sathyan, R. Parrish

Objective: To summarize our knowledge of how glaucoma affects patients' lives, with specific reference to fitness to drive, and to speculate on future directions.
Description: As people age, visual function such as activity, visual field, and vision deteriorate. This is further worsened by binocular conditions such as cataract, macular degenerations, open angle glaucoma, leading to an increase in vehicular accidents per mile driven. The binocular Esterman visual field test, EVFT (the standard to implement the guidelines of Driving & Vehicle Licencing Authority (UK)), integrated visual field testing (IVFT), and a quality-of-life questionnaire, such as VF14, NEI-VQF, are helpful is assessing functional vision in glaucoma patients. A community and governmental participation will reduce the number of patients posing a safety risk in traffic. Put simply, quality of life (QoL) is determined by an individual's assessment of their physical, psychological and social well-being. The right to drive, the freedom to live independently and to otherwise enjoy life all contribute to a 'good' QoL. Each of these has a sight-dependent component. Improving understanding of how glaucoma impacts on QoL should bring the perceptions of ophthalmologists and patients closer together and in doing so, help simplify the process of shared decision-making.

CO-03 NEUROPROTECTION AND APOPTOSIS OF RETINAL GANGLION CELLS RELATED TO GLAUCOMA
N. Gupta (chair), M. Schwartz (chair), J. Lindsey, F. Cordeiro, R. Fechtner
Retinal ganglion cell injury and death – J. Lindsey
Protecting retinal ganglion cells in pre-clinical studies – F. Cordeiro
Measuring neuroprotection: Clinical trials and clinical practice – R. Fechtner

Objectives: 1. To provide the latest information on why retinal ganglion cells die in glaucoma; 2. To demonstrate models used to test glaucoma neuroprotection; 3. To review new developments in neuroprotection clinical trials, clinical measures of neuroprotection success, and applications to glaucoma patient care.
Description: This 1-hour forum will provide ophthalmologists with the newest information regarding the science underlying retinal ganglion cell damage and protection, pre-clinical studies, and recent developments in glaucoma clinical trials with implications for clinical practice.

CO-04 AN OVERVIEW OF NEW INSTRUMENTS AND IMAGING TECHNOLOGY FOR GLAUCOMA
L. Zangwill (chair), M. Kook (chair), D. Greenfield, S. Miglior, M. Nicolela, C. Burgoyne

Description: This course will provide a comprehensive overview of scanning laser imaging devices used in glaucoma. Optical Coherence Tomography (Carl Zeiss Meditec, Inc.), the Heidelberg Retinal Tomograph (Heidelberg Engineering), and the GDx VCC scanning laser polarimetry (Carl Zeiss Meditec, Inc) will be discussed. In addition, spectral domain Optical Coherence Tomography (sd OCT) will also be introduced.
Objectives: 1. To enhance understanding of basic technology for various scanning laser devices including sd OCT; 2. To assist participants to apply these technologies in their clinical practice; 3. To be familiar with various factors affecting diagnostic outcome of these devices.

CO-05 TELEGLAUCOMA
A. Tuulonen (chair), R. George, G. Michelson, S. Shirato

Description: The goal of the course is to present and discuss technology aspects in teleglaucoma, corner-stones in successful telemedicine and cost-effectiveness of telemedicine applications in different countries. The central and explicit goal of health system is to optimize quality of services and costs to ensure the best health benefits to our patients. Telemedicine represents a change in the process of medical care by removing the limitation of distances both for the patient and the doctor. The advantages of new technologies either improve current health care processes, or while performing as well as older methods, cost less.

CO-06 LASER SURGERY OF THE IRIS AND ANGLE: LASER PERIPHERAL IRIDOTOMY, LASER TRABECULOPLASTY, AND LASER IRIDOPLASTY
C. Tham (chair), J. Thygesen, J. Liebmann

Description: This course presents the indications, techniques, results, and complications of the laser procedures on the iris and angle, namely laser peripheral iridotomy, laser trabeculoplasty, and laser iridoplasty.
Objective: At the conclusion of this course, the attendees will be able to choose and perform appropriate laser interventions on the iris and angle in glaucoma patients confidently and safely.
Outline: Introduction, C. Tham; Laser peripheral iridotomy. Indications, Techniques, Results, Complications, J. Liebmann; Laser trabeculoplasty. Indications, Techniques, Results, Complications, J. Thygesen; Laser iridoplasty. Indications, Techniques, Results, Complications, C. Tham.

CO-07 COST CONSIDERATIONS IN PROVIDING GLAUCOMA CARE IN THE DEVELOPING WORLD
R. Thomas (chair), N. Wang

Description: The course will provide an introduction to the CE-tool box, the contents or which are used in a practical approach to diagnosis and treatment, including cost considerations. At the end of the course attendees should understand and have a fair idea about applying this CE tool box in patient management. If we mentioned that CE stands for clinical epidemiology and the tool box consists of sensitivity, specificity, LR's, Diagnostic and Treatment Thresholds, NNT and NNH, etc., you probably won't attend. However, CE is in fact a common sense approach to medicine (and ophthalmology).

CO-08 THE ART OF WRITTEN AND ORAL PRESENTATIONS
R. Hitchings (chair), P. Kaufman

Description and Objective: The aim of this course is to provide the audience with clear guidelines on how and what information can be presented both in papers (be they original research, reviews or case reports) and presentations. The course will focus on how to define an objective, how to set out the process by which the objective will be achieved and how to summarise the results. The course will stress how presentations, both oral and written, need to be tailored to the audience ranging from the lay audience with little medical knowledge, to an audience of ones peers. For the oral presentation, emphasis will be placed both on time keeping and simplicity.

CO-09 HOW TO READ A GLAUCOMA ARTICLE: INTRODUCTORY
N. Congdon (chair), C. Girkin, R. Varma

Description: The principals in reading a glaucoma article are the same as for any technical article, only more so: 1. *Accuracy and objectivity of definitions.* Because glaucoma can be a difficult disease to define, it is especially important in articles on this topic to attend closely to definitions: How is the diagnosis of glaucoma defined? Is it sufficiently detailed that the reader could repeat the study if interested? How are troublesome terms such as 'glaucoma suspect', 'field damage' and 'normal tension glaucoma' defined? 2. *The numbers game.* Are participants accounted for? What are the grounds for 'censoring' participants or excluding them from the analysis? 3. *Do stated conclusions flow logically from the results presented?* Sometimes our data may be saying something different than we wish it did! 4. *Watch those claims.* Be aware of claims such as 'First reported instance', 'Previously un-reported' and 'Novel approach'. There is not much new under the sun!
***Objective*:** To improve course attendees' ability to critically evaluate glaucoma articles.

CO-10 DESIGN, CONDUCT AND INTERPRETATION OF CLINICAL TRIALS: PEARLS AND PITFALLS
K. Singh (chair), Roy Wilson

Objective: The purpose of this course is to have experienced clinical scientists present the pearls and pitfalls of clinical trials. Emphasis will be place on the development of a hypothesis, study design, conduct and interpretation of findings. Concepts such as randomization, masking, bias and conflict of interest will be addressed. The course will be interactive with plenty of time for questions and comments from the audience.
Description: The prospective randomised multicenter clinical trial has become accepted by health care professionals as providing the highest quality of evidence in support of, or against, a particular hypothesis evaluating new or existing therapy. Over the past decade, several large prospective multicenter randomised clinical trials have provided epidemiologic evidence to support glaucoma practice. While prospective multicenter randomised clinical trials have undoubtedly added to our understanding and influenced the treatment of glaucoma patients, all such studies are not created, conducted or interpreted equally well. The potential for bias, misunderstanding and incorrect interpretation is by no means eliminated simply by conducting such a study. When performed correctly, and with scientific integrity, the randomised clinical trial is unsurpassed in epidemiologic circles. In less than ideal circumstances, it may provide information that is no better than that from a lesser study design.

CO-11
Cancelled

CO-12 EVIDENCE-BASED GLAUCOMA
A. Coleman (chair), L. Rossetti, S. Miglior, R. Parikh

Synopsis: This course will cover the evidence that is currently available for several important issues in the management of glaucoma patients.
Objective: For the attendee to understand the evidence for using and setting target intraocular pressures (IOPs) and for using or not using central corneal thickness (CCT) measurements in the management of glaucoma patients, and to understand the recent results of a meta-analysis on antiglaucoma medications.
Outline: I. Introduction, A.L. Coleman; II. Target IOP in management, S. Miglior; III. Role of CCT in glaucoma, R. Parikh; IV. Meta-analysis of Therapeutics, L. Rossetti; V. Discussion, A.L. Coleman.

CO-13 GLAUCOMA SOCIETY ORGANIZATION
R. Wilson (chair), P. Chew, Y. Kitazawa, C. Migdal

Objective: To provide a framework for glaucoma society organization across the spectrum of starting to mature societies, and expert advice for problem solving during discussion session.
Description: The essential components for a starting, growing, and mature society will be explained with applicable modifications for individual situations. An expert panel with experience in society building will discuss solutions to problems they encountered and those submitted by the audience.

CO-14 GLAUCOMA PATIENT ORGANIZATION (HOW TO ORGANIZE, INTERACT WITH GPO)
G. Lambrou (chair), B. Lindsell (chair), S. Christensen (chair), I. Goldberg, R. Ritch, D. Wright

Outline: 1. Setting up a local glaucoma patient support group; 2. Setting up a national GPO; 3. Incorporate or not?; 4. What can the regional or international GPO's offer?; 5.

How to make an ally of your Ophthalmologist; 6; Money! All the good things you can do without it.

CO-15 OPTIC NERVE HEAD EVALUATION
R. Susanna (chair), C. Leung H.T. Wong

Description: The reliance on intraocular pressure (IOP) for glaucoma diagnosis has several limitations: corneal thickness affects accuracy; IOP fluctuates; and IOP damage thresholds vary among individuals. It is therefore critically important that detection of glaucomatous optic neuropathy (GON) rather than elevated IOP become the basis for diagnosing glaucoma
Objective: To provide practical ways to detect and follow GON.
Outline: Introduction, R. Susanna Jr; How to diagnose and follow glaucomatous optic neuropathy: opthalmoscopic aspects, R. Susanna Jr; The role of digital imaging devices for diagnosing and follow GON, C. Leung; How to manage glaucoma suspects, H.T. Wong; Questions and answers.

Thursday, July 19, 2007

3.15-4.15 p.m.

CO-16 GUIDELINES ON DIAGNOSIS AND TREATMENT OF ACG – PART 1 AND 2
D. Friedman (chair), T. Aung, T. Wang, N. Wang, J. Zhao, M. He, W. Nolan

Objectives: To review the consensus panel findings on angle closure epidemiology, mechanism definitions, screening and management. This will be a comprehensive review of key elements of angle closure glaucoma including gonioscopy, laser and incisional surgeries, and imaging.
Description: So far, there are so many guidelines on diagnosis and treatment of ACG, but none of them is generally accepted in ACG practice in China. We also do not have guidelines on diagnosis and treatment of ACG. In my presentation, the reasons and difficulties and potential widely used guidelines on diagnosis and treatment of ACG will be analysed and discussed in detail. This course will cover the findings of the AIGS Consensus Panel on angle closure and angle-closure glaucoma.
Outline: *Session 1 (7-minute talks):* Introduction to AIGS Consensus process and definitions, D. Friedman; Magnitude of the problem, J. Zhao; Mechanisms of ACG (UBM findings), M. He; Consensus Statements on Surgical Management of Angle Closure Glaucoma, T. Aung; Consensus Statements on Medical Management of ACG, T.H. Wang; Laser Management of Angle Closure (not iridoplasty), W. Nolan. *Session 2 (5-minute talks):* Introduction to AIGS Consensus process and definitions, D. Friedman; Gonioscopy consensus statements, T.H. Wang; Angle Closure Mechanisms Consensus Statements, N. Wang; Brief Review of Provocative and Consensus Statements, R. Sihota; Management of acute angle closure attacks, T. Aung; Iridoplasty, W. Nolan; Fundamental Issues in Screening: Review of Terminology of Screening, J. Zhao; Screening for angle closure: Consensus Statements, M. He; Future research in Angle Closure, P. RojanaPongpun.

CO-17 NEW TONOMETRY, CCT - PART 1 AND 2
L. Pillunat (chair), J. Brandt, N. Congdon

Objective: To understand current opinion regarding the association between CCT and glaucoma risk, including potential mechanisms, and the role of other potential mediating factors such as race, eye wall bio-elasticity and axial length.
Description: I. OHTS found thinner CCT to be an independent risk factor for incident glaucoma. Subsequent clinic-based studies have confirmed this, though population-based studies have not. The reasons for this discrepancy are not well understood. II. It is possible that thinner CCT among certain races may partly explain their increased burden of risk for glaucoma. III. IOP is may be underestimated in persons with thinner CCT, leading to less aggressive treatment. Alternatively, thinner CCT may have a direct association with glaucoma risk, not mediated through IOP. IV. Testing different tonometers in patients with canulated anterior chambers for IOP adjustments showed that Goldmann applanation tonometry is significantly dependent on CCT. In Dynamic Contour Tonometry (Pascal) there was no clinically relevant effect of CCT detectable. V. Recent clinical and population-based studies suggest that other related factors such as corneal bio-elasticity and axial length may also contribute to glaucoma risk.

CO-18 GONIOSCOPY AND IMAGING FOR CHAMBER ANGLE EVALUATION – PART 1 AND 2
P. Chew (chair), J. Liebmann (chair), T. Dada (chair), C. Traverso (chair), K. Kashiwagi, S. Lin, H. Sakai, E. Leuenberger

Description: This course is intended to highlight new anterior segment imaging modalities available to the glaucoma specialists for anterior chamber angle evaluation, their comparison with each other and with gonioscopy. The course will include angle evaluation with ultrasound biomicroscopy, anterior segment OCT and peripheral anterior chamber depth analyzer in addition to gonioscopy. The basic principles of imaging, types of machines, recording of various angle parameters, clinical utility in diagnosis of primary angle closure, provocative testing, utility as a screening tool, advantages and limitations of each technique will be discussed. Clinical examples will be presented to show utility of each technique in clinical practice.

CO-19 ADVANCES IN PSYCHOPHYSICAL TESTING FOR GLAUCOMA PATIENTS - PART 1 AND 2
C. Johnson (chair), J. Flanagan, R. Harwerth

Description: This course will present an overview of new psychophysical test procedures that have been used for the evaluation of glaucoma. First, the underlying physiological basis for these tests will be described, along with the current evidence to support them. This will be followed by a discussion of the relationship between psychophysical test results and structural (optic nerve and retinal nerve fiber layer) deficits in glaucoma. Next, the clinical significance of psychophysical test results for the detection and management of glaucoma will be described, followed by a discussion of these results in relation to other clinical characteristics in glaucoma. Below is the plan we have outlined for parts 1 and 2 of the course. For part 1, John Flanagan, Ron Harwerth and Chris Johnson are the participants. For part 1, we have

decided to divide up the available time among us into 3 presentations (about 15 minutes each, with time for questions from the audience). The titles of the presentations are listed below. For part II, Chris Johnson will present a brief introduction, followed by four talks (about 12 minutes each, with time for questions) from Flanagan, Harwerth, Leuenberger and Stamper. Again titles are listed below. .
Outline part I: Psychophysical diagnostic procedures used in glaucoma and methods of analysis, J. Flanagan; Psychophysical test strategies used in glaucoma diagnosis (SITA, ZEST, TOP), C. Johnson; Comparisons between animal and human models of glaucoma, R. Harwerth.
Outline part 2: Introductory remarks. C. Johnson; The physiological basis for new psychophysical tests in glaucoma, J. Flanagan; The relationship between function (psychophysics) and structure (optic nerve and retinal nerve fiber layer) in glaucoma, R. Harwerth; The importance of psychophysical testing for clinical assessment of glaucoma, E. Leuenberger; Putting it all together: combining psychophysical test information with clinical findings, B. Stamper.

CO-20 HOW TO DETECT AND CONFIRM PROGRESSION AND USE IT TO MANAGE GLAUCOMA – PART 1 AND 2
B. Chauhan (chair), T. Garway Heath (chair), A. Heijl, L. Zangwill

Objective: 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.
Description: 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. The ideal is to know the rate of progression of all our patients. This is clearly a goal of glaucoma management. 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. Therefore, monitoring approaches need to be able to detect those progressing faster than anticipated by identifying progression ‘events’ (the 'safety net' approach). 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. In conclusion: Measuring rates of progression is optimal for good glaucoma care; risk profiling identifies patients at higher risk of functional visual impairment; if necessary resources are lacking, available resources should be concentrated on those at considerable/highest risk; both visual function and imaging measurements are needed to identify all progressing patients; greater availability of hardware and software support is needed to make use of current technology.

CO-21 ADVANCED OPTIC NERVE IMAGING (HRT, GDX, OCT) - PART 1 AND 2
H. Lemij (chair), R. Burk, M. Fingeret, C. Leung, F. Medeiros

Part 1: In this course, the working principles of the three main imaging devices (HRT, GDx, OCT) for optic nerve imaging in glaucoma will be explained. In addition, their print-outs will be discussed in detail.
Part 2: The clinical utility in the management of glaucoma of the three main imaging devices (HRT, GDx, OCT) for optic nerve imaging will be discussed, both for classification and progression detection. Many case examples will be shown.

CO-22 PRINCIPLES OF MEDICAL THERAPY IN GLAUCOMA PRACTICE - PART 1 AND 2
C. Melamed, S. Miglior, H. Tanihara, J. Thygesen, R. Fechtner (chair)

Objective: At the conclusion of the course the attendee will be familiar with the many medical alternatives for treatment of glaucoma and will be able to select rational initial and adjunctive therapy. He will better understand some of the obstacles to assessing the effectiveness of therapy and will be familiar with promising areas of research for future medical treatments.
Description: *Part 1:* At present, many kinds of drugs have been clinically used for medical treatments of glaucoma. For strategy on the development of novel medical treatments, we focused on two concepts, neuroprotection and IOP reduction related to conventional outflow pathway. Among many candidate drugs, ROCK inhibitors and associated drugs have desirable characteristics for medical treatments of glaucoma. A series of experiments using those drugs showed distinguished IOP-lowering and axon-protective effects in animal eyes. Also, we are in the process of conducting a clinical trial. Also, in my presentation, I would like to discuss the potential of neuroprotective and novel IOP-reducing drugs. *Part 2 (Development of a novel drug: ROCK inhibitors and associated drugs):* Medical therapy remains a mainstay of treatment for glaucoma. The clinician must consider the characteristics of the patient and the properties of the medication when selecting appropriate therapy. This course will review principles for selecting and evaluating glaucoma therapies.

CO-23 OPTIMIZING TRABECULECTOMY OUTCOME: INTROPERATIVE TECHNIQUES
F. Grehn (chair), E. Dahan, C. Girkin, P. Khaw, L. Wang, D. Wen Lu

Objective: Description of the ‘ideal trabeculectomy’.
Outline: Limbus versus fornix based conjunctival approach; Scleral flap configuration and flap closure; Trabeculectomy, goniotrephination, punch; Application of antimetabolites; Conjunctival closure; Options of anaesthesia in trabeculectomy; Adapting intraoperative techniques to pre- and postoperative treatment and measures.

CO-24 FILTERING SURGERY: PENETRATING/NON-PENETRATING/IMPLANTS - PART 1 AND 2
T. Shaarawy (chair), A. Mermoud, P. Palmberg, R. Carassa

Description: These two courses address practical issues and provide clear guidance from leading experts on multiple topics pertaining to glaucoma filtering surgery. The courses also function as forums where participants can freely ask

questions and advice on cases presented and from their own experiences. It has never been more exciting in the field of glaucoma surgery, since Von Graefe described his iridectomy. The last years have seen a surge in interest in glaucoma surgery, and multiple research groups have taken multiple directions offering solutions, and potential breakthroughs. The symposium examines newer modalities and discusses pros and cons of each newly proposed technique.

CO-25 PROOF OF GANGLION CELL DEATH PREVENTION
K. Martin (chair), M. Schwartz (chair), Y. Yücel, H. Levkovitch-Verbin, D. Greenfield

Outline: Memantine and retinal ganglion cell death, Y. Yücel; Minocycline and retinal ganglion cell death, H. Levkovitch-Verbin; Immune mechanisms in retinal ganglion cell death and survival, M. Schwartz; Measuring ganglion cell protection: Clinical trials and clinical practice, D. Greenfield.

CO-26 VISUAL FIELDS IN ADVANCED GLAUCOMA
R. Stamper (chair), F. Goni, M. Nicolela

Description: Standard automated visual fields are often a frustrating and wasted experience for patients with advanced glaucoma. Once the condition has destroyed most of the visual field, special techniques are indicated to bring out the most useful information for following the condition. This course will cover Goldmann Visual Fields, use of larger test objects, 10-2 automated visual fields, and algorithms that make the experience less frustrating. Illustrative cases will be presented. A question and answer period will allow discussion of any points uncovered or special situations.
Outline: Introduction, R. Stamper; Techniques using the automated perimeter (larger test objects, 10-2), R. Stamper; Switching from standard automated perimetry to alternative approaches in advanced glaucoma, F. Goni; Other perimetric techniques including Goldmann perimetry in advanced glaucoma, M. Nicolela; Three brief illustrative cases, each panelist brings one for the other panelists to discuss); Questions and answers.

CO-27 DO WESTERN TRIALS HAVE AN IMPACT ON 'EASTERN' GLAUCOMA CARE?
R. Thomas (chair), K. Singh, T. Yamamoto

Description: Several randomized controlled clinical trials (RCT's) have addressed critical questions across the spectrum of glaucoma. Most RCTR's were conducted on the Caucasian populations of western countries and the question arises whether the results of such trials can be extrapolated to populations of the 'eastern' regions? This course will address the results of some of the relevant 'glaucoma' RCT's. At the end of the course the attendees should be familiar with the ground rules for extrapolation and will be able to assess the applicability relevant RCT's to glaucoma care in the Asian region.

CO-28 GLAUCOMA BIOSTATISTICS
B. Feuer, L. Rossetti (chair), Seang Mei Saw

Objective: To provide some basic concepts of biostatistics applied to medicine and in particular to glaucoma with special attention to comparing continuous variables (*e.g.* IOP) or proportions, but also survival analysis (*e.g.* comparison of visual field progression rates in clinical trials). Increased use of imaging techniques makes analyses for evaluating reproducibility/agreement and diagnostic test assessment of great interest.
Description: Knowledge of biostatistics has become more and more important also in the field of glaucoma. To know how to interpret the results of a statistical test, the meaning of confidence intervals or the statistical power of a clinical trial is today fundamental for all those who want to critically read medical literature.

CO-29 GONIOSCOPY
P. Chew, R. Sihota, L. Alward (chair)

Description: This course will be an introduction to gonioscopy beginning with basic aspects of the examination technique and a discussion of the various lenses. Grading systems for gonioscopy will be reviewed. Special techniques used in gonioscopy such as indentation (dynamic) gonioscopy and the use of the corneal wedge (parallelopiped) will be emphasized. The course will close with video and photographic examples of findings in gonioscopic examination.

4.30-5.30 p.m.

CO-30 GLAUCOMA EPIDEMIOLOGY: THERAPEUTICS
R. Wilson (chair), A. Coleman, F. Topouzis, R. Thomas

Description and Objective: Based on evidence-based data, this course will provide guidance on relative merits of medicines, lasers, and surgery in the treatment of glaucoma. Particular emphasis will be placed on reviewing the evidence from major glaucoma therapy clinical trials and population-based studies. The choice of therapy may differ in some parts of the world due to healthcare infrastructure issues. Special considerations in developing countries will be reviewed. At the end of the course, participants will (1) understand the evidence-based literature on glaucoma therapy, (2) be able to apply the recommendations from the literature to their own practice, (3) know when exceptions to the evidence-based recommendations should be considered, and (4) understand acceptable alternative approaches to therapy when the recommended first option is not feasible.

CO-31
***See* CO-16**

CO-32
***See* CO-20**

CO-33
***See* CO-17**

CO-34
***See* CO-18**

CO-35
***See* CO-19**

CO-36
***See* CO-21**

CO-37
***See* CO-22**

CO-38
***See* CO-23**

CO-39
***See* CO-24**

CO-40 OPTIC-DISC PHOTOGRAPHY
H. Danesh Meyer, J. Jonas (chair), P. Mitchell, M. Nicolela

Objective and Description: By using simple ophthalmoscopic techniques such as disc photography, the attendee should learn to differentiate between primary versus secondary macrodiscs, and between primary versus glaucomatous macrocups; to apply the ISNT-rule for early glaucoma diagnosis; to know the importance of presence and location disc hemorrhages; to assess peripapillary atrophy and the retinal nerve fiber layer; to detect retinal microvascular abnormalities; to know the ethnic difference in the optic discappearance; and to examine the optic disc dynamically by modified ophthalmodynamometry.

CO-41 ELECTROPHYSIOLOGY AND GLAUCOMA DIAGNOSIS
B. Fortune (chair), V. Porciatti (chair), C. Bowd, S. Graham

Objective: To describe the role of electrophysiological testing in glaucoma diagnosis based on a review of evidence from both basic and clinical studies. Following a brief introduction, and general overview of electrodiagnostic techniques, this course will focus on the pattern electroretinogram (PERG) and multifocal visual evoked potential (mfVEP).
Description: We will describe the utility of these tests as a means for detecting and monitoring functional loss in glaucoma. 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. The full-field ERG represents largely the function of photoreceptors and bipolar cells, and is only minimally affected in glaucoma. The sensitivity and specificity of glaucoma diagnosis by PERG will also be reviewed from an evidence-based perspective, as will the correlation between PERG response parameters, visual field sensitivity and nerve fiber layer thickness. The multifocal visual evoked potential (mfVEP) has now been established as an effective *objective* method of perimetry in glaucoma. Moreover, there is evidence from several cross-sectional and theoretical studies, which suggest that the mfVEP should be able to detect progression in early-stage glaucoma more effectively than standard automated perimetry (SAP). Confirmation of this awaits further evidence from ongoing longitudinal studies at several different centers.
Conclusions: Electrophysiological measures of vision function, when properly chosen and applied, offer an important alternative to standard automated perimetry (SAP) in the diagnosis and follow-up of glaucoma. These complementary measures are able to document abnormalities in circumstances where SAP is insensitive or unreliable, in patients whom produce unreliable threshold visual field results, or during the very early stages of glaucoma/OHT.

CO-42 ASSESSMENT OF BLOODFLOW IN GLAUCOMA
S. Orgül (chair), M. Araie (chair), A. Harris, L. Schmetterer

Objective: To increase the audience's awareness that hypoxia, ischemia, and/or reperfusion may have different effects within the tissue. Furthermore, blood flow depends on perfusion pressure, which however, can not be measured directly within the eye and common estimates may be erroneous, especially in glaucoma. The audience will be confronted with the specific information provided by the various techniques, including blood flow related parameters such as vascular diameter and blood flow velocity, but also physical factors with a linear response to blood flow changes and newer technology at the horizon.

CO-43 IMAGING TECHNOLOGIES
R. Burk (chair), E. Hoffman, H.T. Wong, G. Tomita

Outline and Description: The objective of this course on imaging technologies in glaucoma is to demonstrate possibilities and limitations of early diagnosis and follow-up with respect to the clinical context in the three most advanced fields in imaging technology. These are optical coherence tomography (OCT) laser scanning polarimetry (GDX) and laser scanning tomography (HRT), represented each by experts in their field. The course instructors will present highlights and pitfalls and discuss clinical relevant findings as well as promising new approaches to implement these diagnostic tools into everyday routine.

Friday, July 20, 2007

3.15-4.15 p.m.

CO-44
***See* CO-16**

CO-45
***See* CO-17**

CO-46
***See* CO-18**

CO-47
***See* CO-20**

CO-48
***See* CO-21**

CO-49
***See* CO-22**

CO-50
***See* CO-24**

CO-51
***See* CO-23**

CO-52 NON-IOP LOWERING GLAUCOMA TREATMENT
J. Flammer (chair), M. Mozaffarieh, X. Sun

Objective: The main aim of the course is, on one hand, to summarize what is going on at the research level, and on the other hand to give clinicians guidelines that may already be used in clinical practice.
Description: The classical glaucoma treatment focuses on IOP reduction. Better knowledge of the pathogenesis has

opened up new therapeutical approaches. Whilst most of these new avenues of treatment are still in the experimental phase, others, are already used by some physicians. Blood pressure dips can be avoided by increased intake of salt or fludrocortisone. Vascular regulation can be improved locally by carbonic anhydrase inhibitors, systemically with magnesium or with low doses of calcium channel blockers. Experimentally, glaucomatous optic neuropathy (GON) can be prevented by inhibition of astrocyte activation, either by blockage of epidermal growth factor receptors or by counteracting Endothelin. GON can also be prevented by nitric oxide-2 synthase inhibition. Inhibition of matrix metalloproteinase-9 inhibits apoptosis of retinal ganglion cells and tissue remodelling. Upregulation of heat shock proteins protects the retinal ganglion cells and the optic nerve head. Reduction of oxidative stress especially at the level of mitochondria also seems to be protective. This can be achieved by gingko, dark chocolate, polyphenolic flavonoids occurring in tea, coffee or red wine and anthocyanosides found in bilberries.

CO-53 SECONDARY OPEN ANGLE GLAUCOMA: DIAGNOSIS AND TREATMENT
T. Yamamoto (chair), R. George, S. Gandolfi

Description: Management of secondary glaucoma is still a challenging issue. We needs different point of view in treating secondary glaucoma from primary one. This course will address management of a couple of common types of secondary open angle glaucoma in Asian regions such as uveitic glaucoma, exfoliation syndrome and steroid-induced glaucoma. In addition, diagnostic tips, especially ones on gonioscopy will be lectured.

CO-54 EXFOLIATION SYNDROME AND EXFOLIATION GLAUCOMA
R. Ritch (chair), A. Konstas, U. Schlötzer-Schrehardt

Synopsis and Objective: Exfoliation syndrome is an age-related disorder of the extracellular matrix characterized by the accumulation of fibrillar material in many tissues. It affects about 60 million people and is the most common identifiable cause worldwide, comprising the majority of open-angle glaucoma in some countries. It leads not only to severe, chronic open-angle glaucoma, but also to lens subluxation, angle-closure, blood-aqueous barrier impairment, and serious complications at the time of cataract extraction. Vascular and systemic abnormalities are increasingly reported. The audience will gain an understanding of the epidemiology, ocular and systemic features, molecular biology, and treatment of this unique disorder. ***Outline:*** Epidemiology and clinical findings, R. Ritch; Molecular biology and pathology, U. Schlötzer-Schrehardt; Current and future approaches to treatment, A.G.P. Konstas.

CO-55 UNDERSTANDING THE GENETIC BASIS OF GLAUCOMA: ITS ROLE IN CLINICAL PRACTICE
L. Alward (chair), S. Chakrabarthi, J. Craig, D. Mackey

Description: Designed for the practicing glaucoma specialist, this course reviews the molecular genetics of glaucoma with an emphasis on the impact of genetics on clinical practice. The course will begin with a discussion on how glaucoma related genes are discovered and the roll of the glaucoma specialist in finding patients and families who might advance this research. We will then discuss what is currently known about glaucoma genetics. We will discuss how to approach a patient who has a family history of glaucoma and will conclude by looking at future applications of glaucoma genetics in the management of this disease.
Conclusions: 1. Much of glaucoma is heritable; 2. Eleven linkage sites have been identified for primary open angle glaucoma; 3. Three genes have been identified for POAG (myocilin, optineurin, WDR-36); 4. Genes have been identified for several syndromic forms of glaucoma; 5. Ophthalmologists should know how to counsel patients and families; 6. An understanding of glaucoma genetics will change the way that we diagnosis and treatment of glaucoma patients.

CO-56 EXPERIMENTAL MODELS IN GLAUCOMA
J. Lindsey (chair), R. Harwerth

Description: Investigation of the biological basis of glaucoma has been advanced by study of glaucoma models that allow experiments not possible in humans. In addition, models facilitate testing of potential treatments to establish proof of principle for potential treatments prior to human testing. This course will compare the strengths and limitations of established as well as new model types. Also, it will illustrate how they can be used to investigate challenging issues in glaucoma such as neuroprotection, oxidative damage, axon-specific mechanisms, standard automated perimetry and optical coherence tomography.

CO-57 GLAUCOMA SURGERY
T. Zeyen (chair), Y. Kuwayama, C. Migdal, P. RojanaPongpun, T. Shaarawy, M. Sherwood

Description: In this course the attendants will receive an overview of the most frequently performed surgical procedures for glaucoma. The indications for each type of surgery will be emphasized as well as the key features for success. 1. Iridectomy: a. Indications; b. Technique. 2. Filtration surgery: a. Safe trabeculectomy technique; b. Non-perforating filtering surgery; c. Post-operative management. 3. Surgical management of coexisting cataract and glaucoma. 4. Surgery for congenital glaucoma. 5. Cyclodestructive procedures. 6. Tubes in glaucoma surgery.

4.30-5.30 p.m.

CO-58
***See* CO-16**

CO-59
***See* CO-20**

CO-60
***See* CO-17**

CO-61
***See* CO-18**

CO-62
***See* CO-21**

CO-63
***See* CO-22**

CO-64
***See* CO-23**

CO-65
***See* CO-24**

CO-66
Cancelled

CO-67 SECONDARY ANGLE CLOSURE GLAUCOMA: DIAGNOSIS AND MANAGEMENT
L. Vijaya (chair), S. Asawaphureekorn

Description: The course is intended to provide an overview of mechanisms and pathogenesis of secondary angle closure glaucoma and principles involved in the management. It emphasizes the role of ultrasound biomicroscopy in diagnosis and management decisions. It will also cover three major clinical situations that can lead into secondary angle closure glaucoma, namely: (1) Phacomorphic Glaucoma; (2) Lens disorders resulting in secondary angle closure; and (3) Uveitic secondary angle closure. Case presentations will be used to illustrate the main concepts.

CO-68 GLAUCOMA CARE IN EYES WITH CONCURRENT CORNEAL DISEASE
J. Tsai (chair), S. Seah, C. Tham

Outline: I. Anterior Segment Dysgenesis – A. Axenfeld-Rieger Syndrome/Anomaly; B. Peters anomaly; C. Aniridia. II. Iridocorneal Endothelial (ICE) Syndrome – A. Chandler Syndrome; B. Progressive Iris Atrophy; C. Cogan-Reese Syndrome. III. Fuchs' Endothelial Dystrophy. IV. Bullous Keratopathy – A. Aphakic; B. Pseudophakic. V. Questions and Answers.

CO-69 NORMAL PRESSURE GLAUCOMA
Y. Kitazawa (chair), J. Flammer (chair), T. Krupin, K.H. Park, R. Ritch, M. Wax, T. Yamamoto

Description: Normal-tension glaucoma (NTG) is a relatively common type of glaucoma and yet our understanding of its pathogenesis and treatment is considerably limited. Although the IOP seems to be a key risk factor and IOP reduction seems to be beneficial, evidences indicate the non-IOP related factors can play a role in the development of the disease. In fact, non-IOP-related therapy is still desired. In this course an outstanding international panel of speakers discusses the practical issues of this disease to help us understand better its management. ***Outline:*** Disc hemorrhage &risk factors other than IOP, K.H. Park; IOP as a risk factor, T. Krupin; Cause(s) of glaucomatous optic neuropathy, M. Wax; Neuroprotective therapy, R. Ritch; Ocular hypotensive therapy, T. Yamamoto.

CO-70 CONGENITAL AND INFANTILE GLAUCOMA – DIAGNOSIS AND MANAGEMENT PEARLS
P.T. Khaw (chair), A. Mandal (chair), J. Brandt, H.-Ch. Lin, E. Maul, M. Papadopoulos

Description: The congenital and infantile glaucomas pose some of the greatest challenges to the ophthalmologist. There are variations in the management of these patients in different parts of the world. In this course experienced experts from different parts of the world will present key aspects of their personal patient mix and presentation and deliver valuable pearls of general and surgical management from their extensive experience. Objective: To learn about different practice patterns and pearls of paediatric glaucoma management from a highly experienced group of clinicians from around the world.
Outline: Introduction; Indian perspective, A. Mandal; USA perspective, J. Brandt; East Asian perspective, Ching Lin Ho; South American perspective, E. Maul; UK/European perspective including, the UK BIG EYE study, M. Papadopoulos; Questions.

CO-71 PERIMETRY
F. Goni (chair), A. Viswanathan

Description: The visual field is the region of space from which photons in the visible spectrum can enter the eye or eyes leading to the perception of light. Sophisticated testing procedures, such as automated perimetry, have been developed to quantify the hill of vision. POAG is associated with well-recognised patterns of visual field loss, which aid diagnosis and management. However, the results of automated visual field testing are also subject to non-pathological artifact: this needs to be considered when evaluating these results. Five key questions in visual field interpretation in glaucoma are: 1. How reliable a record of optic nerve function is the visual field? 2. Is there visual field impairment? 3. What is the extent of damage? 4. What is the location of the damage? 5. Is there progressive deterioration? A useful mnemonic for these five features is FIELD: Fidelity, Impairment, Extent, Location, Deterioration.

Saturday, July 21, 2007

2.00-3.00 p.m.

CO-72 VIDEO COURSE: COMBINED PHACOTRABECULECTOMY: BASIC TECHNIQUES
E. Maul (co-chair), J. Tsai (co-chair), A. Brooks, R. Perez Grossman

Objective: To provide the attendee with instruction on basic techniques in phacotrabeculectomy, including site approach for combineds, conjunctival and scleral management, cataract techniques and IOL selection in combined surgery. Video presentations will be used to present these techniques by international faculty.
Outline: One site versus two site technique; Conjucntival management in combined surgery; Scleral flap management in combined surgery; IOP selection in combined surgery.

CO-73 VIDEO COURSE: COMBINED PHACOTRABECULECTOMY: ADVANCED TECHNIQUES/SPECIAL SCENARIOS
I. Ahmed (chair), S. Vold, N. Wang, F. El-Sayyad

Objective: To provide the attendee with instruction on advanced techniques in phacotrabeculectomy, including handling positive pressure, small pupil management, zonular weakness and IOL placement in event of capsular rupture. Video presentations will be used to present these techniques by international faculty.
Outline: Handling positive pressure; Small pupil manage-

ment; Dealing with zonular weakness; IOL placement in event of capsular rupture

CO-74 TRABECULECTOMY: BASIC TECHNIQUES
A. Sit (co-chair), Y. Kuwayama (co-chair), S. Best, L. Wang

Objective: To provide the attendee with instruction on basic techniques in trabeculectomy, including conjunctival opening and closing, sclerostomy, scleral flap closure and antimetabolite usage. Video presentations will be used to present these techniques by international faculty.
Outline: Conjunctival open/closure: fornix based versus limbal based ; Sclerostomy: punch versus knife/scissors; Scleral closure suturing techniques; Antimetabolites usage/ application.

CO-75 TRABECULECTOMY: ADVANCED TECHNIQUES/ SPECIAL SCENARIOS
P. RojanaPongpun (chair), K. Singh (co-chair), S. Seah, J. Mura

Objective: To provide the attendee with instruction on advanced techniques in trabeculectomy, including management of difficult conjunctiva, scleral flap dissections, and bleb revision for overfiltration or failing filter. Video presentations will be used to present these techniques by international faculty.
Outline: Managing buttonhole in conjunctiva; Handling scarred tissue; Scleral flap problems; Bleb revision techniques for overfiltration; Bleb revision techniques for failing filter.

CO-76 MANAGING CATARACT AND GLAUCOMA
D. Lam (chair), C. Traverso, R. Fechtner, M. Sherwood

Objective: To assist attendees to develop good surgical strategies and choose the right techniques for patients with concomitant cataract and glaucoma.
Description: 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.
Outline: Introduction; Combined versus sequential surgery; One-site versus two-site phacotrabeculectomy; Surgical tips of phaco in small pupil and shallow AC cases; Video presentation of my preferred technique of combined phacotrabeculectomy; Cases illustration and discussion; Questionas and answers.

CO-77 SAFE AND EFFECTIVE GLAUCOMA DRAINAGE DEVICE IMPLANTATION
I. Goldberg (chair), P. Kuan, C. Tham, M. Agulto, P. RojanaPongpun, F. Kheong, P. Healey, H. Lin

Synopisis: This course will cover all aspects of glaucoma drainage devices (GDD), including indications, methods for implanting each device, device differences, complications and its management, alternatives and outcomes of implanting such devices. It is designed to have maximum audience participation and interaction and lively panel discussions from all panelists.
Objective: At the end of the course the participant will be able to have full knowledge of the various tubes available, which ones that are more widely used, its implantation techniques, what are the possible complications and how to manage them, various alternatives to tubes and what are the short term and long term outcomes for each device.

CO-78 SIZE MATTERS: INTRAOCULAR SURGERY IN HIGHLY MIOPIC OR NANOPHTHALMIC EYES
D. Grigera (chair), T.-S. Hoh, H. Tanihara

Synopsis: There are three topics: 1. Potential hazards in odd-sized eyes. It will deal with the potential problems and with the recognition of the risk factors; 2. Coping with the oversized. Answers on how to prevent and to manage complications in highly myopic eyes such as overfiltration, hypotonous maculopathy, suprachoroidal hemorrhage; 3. Coping with the undersized. How to prevent and to manage complications in nanophthalmic eyes such as ciliochoroidal effusion, malignant glaucoma and others.
Description: The presentation will be focused on the following five issues. 1. Enlargement of the globe may be caused by glaucoma. Enlarged corneal diameter is a sign for the diagnosis of primary congenital glaucoma; 2. Myopia is a clinical background related to the onset and progression of glaucoma; 3. Myopia is regarded as a risk factor for hypotony maculopathy; 4. Biometric findings are important for understanding the mechanismss of primary angle closure (glaucoma). 5. Nanophthalmos is a crucil risk factor for visual-threatening complications after surgery in glaucomatous eyes. Understanding the significance of the size-related matters is very important for safe management of the glaucoma.
Objective: To deliver information to the attendees that can be readily incorporated into clinical practice. Pearls gleaned from clinical experience will be shared.

CO-79 FIBROSIS INHIBITION IN FILTRATION SURGERY
J. Crowston (chair), P. Palmberg, C. Baudouin, P. Roux, T. Wong

Objective: To illustrate the use of Beta-radiation as an inhibitor of fibrosis in filtration surgery.
Description: The history of radio therapy and effects of radiation on tissue will be briefly discussed; the technique of use will be demonstrated; precautions and safety measures will be mentioned; clinical effect on blebs will be shown; side effects and complications will be discussed; results will be shown. Postoperative scar formation is the major cause of inadequate IOP lowering and surgical failure after trabeculectomy. T. Wong and C. Baudouin will provide insight into the post operative healing response and the risk factors that predispose to scarring. Anti-scarring treatments have had a significant impact in improving surgical outcomes. P. Roux and J. Crowston will describe the characteristics of different antifibrosis treatments. Finally P. Palmberg will provide clinical pearls on how we can get the most out of anti-scarring therapies in clinical practice.

CO-80 THE USE OF RELEASABLE SUTURES IN GLAUCOMA SURGERY
R.P. Wilson (chair), Tony Wells

Objective: To teach three different methods for using releasable sutures in glaucoma surgery.
Outline: 1) Short history of releasable evolving to adjustable suture techniques; 2) Releasable/adjustable sutures versus

laser suturelysis; 3) Comparison of techniques – pros and cons with technique demonstration: A. Cohen/Osher technique. B. Wilson technique, a. Releasable; b. Adjustable; c. Khaw technique for adjustable suture.

CO-81 DECISION MAKING AFTER TRABECULECTOMY HAS FAILED
R. Carassa (chair), J. Brandt, K. Ishida

Objective: When trabeculectomy fails completely, surgeons must choose among revision of previous surgery, second trabeculectomy, drainage implant or cyclodiode. A revision of a failed trabeculectomy is at great risk of failure and complications and thus is seldom performed. A second trabeculectomy with adjuctive use of MMC can be considered when a new surgical site is available, while an implant is required when the risk of further failure for trabeculectomy is high. Cyclodiode is indicated when the visual function is very compromised. The aim of the course is to present updated information on the different surgical techniques and to provide the participants guidelines on the clinical management of patients after trabeculectomy has failed.
Ouline: Introduction, R. Carassa; Second trabeculectomy with MMC, cyclodiode, K. Ishida;
Tube *vs* Trabeculectomy, J.D. Brandt; Discussion.

CO-82
Cancelled

CO-83 PEDIATRIC GLAUCOMA SURGERY
A.K. Mandal (chair), F. Grehn, E. Maul

Objective: At the conclusion of the course attendees will be conversant with the various surgical techniques and the results in various types of pediatric glaucomas.

Description: Congenital glaucoma is a surgical disease and surgery must be performed at an early age as possible. The surgical options include giniotomy, trabeculotomy, trabeculectomy or primary combined trabeculotomy and trabeculectomy. Antifibrotic therapy and glaucoma drainage implants may be considered in refractory cases. Cycloablative procedures may be deserved as the last option. In these course experts from different part of the world will present the techniques and results of different options available.
Outline: Introduction; Goniotomy, S. Ahmed; Trabeculotomy, C.L. Ho; Combined Trabecolotomy – Trabeculectomy, A.K. Mandal; Trabeculectomy with Antifibrotic Therapy, M. Papadopoulos; Trabeculectomy Augmented by Deep Sclerectomy, MMC and Iridenclesis, Y. Tao; Tube surgery and other devices, J. Brandt; Cycloablative procedures, E. Maul; Summing up.

CO-84 CYCLOPHOTOCOAGULATION - WHY, WHEN AND HOW?
P. Bloom (chair), S. Lin, B. Shields, R. Susanna

Description: This course will teach contemporary methods of cyclophotocoagulation. The aim is to provide attendees with the theoretical information and practical skills necessary to begin to perform these treatments. Why? The rationale for cyclophotocoagulation will be discussed in the context of other modern medical, laser and surgical treatments for glaucoma. Older methods of cycloablation will be mentioned. When? The place of cyclophotocoagulation, both trans-scleral and endoscopic, will be discussed with reference to a modern treatment paradigm. Specifically the relevant timing of these treatments will be discussed in relation to other surgical treatments including trabeculectomy and glaucoma drainage device surgery. How? The surgical techniques will be illustrated by means of graphics, photographic illustrations and videos.

The only way to get the same opinion from a group of three specialists is if two are on vacation.

Harald Bennett, M.D.

POSTER ABSTRACTS

1. GENERAL ASPECTS

1.1. General aspects: Epidemiology

P001 GLAUCOMA LASER AND SURGICAL PROCEDURE RATES IN CANADA: A LONG-TERM PROFILE

J. Campbell[1], Y.M. Buys[2], G.E. Trope[2], R. Rachmiel[2]
[1]Queen's University, KINGSTON, Canada, [2]University of Toronto, TORONTO, Canada

Objectives: New laser and surgical techniques have revolutionized glaucoma therapy. A precise understanding of how these developments are affecting overall glaucoma management is fundamental to health services planning. Therefore, the objective of this study was to generate canadian national and provincial data regarding glaucoma laser and surgical procedure rates from 1992 to 2005.
Design: National health care database study.
Participants: Complete data covering the entire populations of each province and territory of Canada were accessed.
Methods: Canadian provincial and territorial health insurance databases, which cover virtually all surgical procedures provided domestically to Canadians, were accessed to ascertain yearly total procedure numbers. To estimate the number of individuals with glaucoma, an age-stratified glaucoma prevalence model was applied to population estimates.
Main outcome measures: Yearly number of procedures per thousand individuals with glaucoma.
Results: Laser trabeculoplasty rates dramatically increased from 2002-2005 with the national Canadian rate more than doubling. However, this increase varied widely across regions, ranging from 0 to 530%. Trabeculectomy surgery rates slowly increased from 1992 to 1996, then declined by 29% nationally between 1996 and 2005. Glaucoma drainage device (GDD) implantation increased 12-fold nationally from 1992 to 2005. By 2005 GDD implantation accounted for 10% of glaucoma surgeries; however, this procedure remained confined to relatively few regions with only 6 of Canada's 13 provinces and territories providing this surgical service.
Conclusions: In Canada, laser trabeculoplasty rates have risen significantly over recent years, coinciding with the introduction of selective laser trabeculoplasty. Trabeculectomy rates have recently declined, while GDD implantation is playing an increasing role in glaucoma management in Canada.
References:
1. Albright CD, Schuman SG, Netland PA. Usage and cost of laser trabeculoplasty in the United States. Ophthalmic Surg Lasers 2002; 33: 334-336. 2. Paikal D, Yu F, Coleman AL. Trends in glaucoma surgery incidence and reimbursement for physician services in the medicare population from 1995 to 1998. Ophthalmology 2002; 109: 1372-1376. 3. Walland MJ. Glaucoma treatment in Australia: changing patterns of therapy 1994-2003. Clin Exper Ophthalmol 2004; 32: 590-596. 4. Rachmiel R, Trope GE, Chipman ML, Gouws P, Buys YM. Laser trabeculoplasty trends with the introduction of new medical treatments and selective laser trabeculoplasty. J Glaucoma 2006; 15: 306-309. 5. Joshi AB, Parrish RK 2nd, Feuer WF. 2002 Survey of the American Glaucoma Society. Practice preferences for glaucoma surgery and antifibrotic use. J Glaucoma 2005; 14: 172-174.

P002 PREVALENCE AND TYPES OF GLAUCOMA AMONG ADULTS AGED 50 YEARS OR ABOVE IN THE SHUNYI DISTRICT OF BEIJING

J.L. Zhao, H. Liu, F.R. Li Fengrong
Peking Union Medical College Hospital, BEIJING, China

Purpose: To estimate the prevalence of glaucoma among older adults aged ≥50 years in the Shunyi district of Beijing, China.
Design: Population-based cross-sectional survey.
Participants: A random sample of residents 50 years or older from the Shunyi district of Beijing, China.
Methods: Each subject underwent a screening program comprising an interview and an ophthalmic examination, including visual acuity, the intraocular pressure (IOP) with Perkins tonometry, anterior segment examination with slit-lamp, peripheral anterior chamber depth by the Van Herick method, and fundus examination. Glaucoma was diagnosed on the basis of IOP, depth of the peripheral anterior chamber, gonioscopic characteristics, optic disc appearance and ultrasound biomicroscopic (UBM) dark room provocative test.
Main outcome measures: Prevalences of primary angle-closure glaucoma, primary open angle glaucoma, secondary glaucoma, and all cases of glaucoma.
Results: Of 5910 eligible persons, 5308 (89.8%) participated and finished the examination in the study. Estimated prevalences of glaucoma in those over 50 years were 3.33% (95% confidence interval [CI], 2.85%~3.82%), the prevalence of primary angle-closure glaucoma, primary open angle glaucoma and secondary glaucoma was 1.66% (95% CI, 1.31%~2.00%), 1.48%(95% CI, 1.16%~1.81%), and 0.19% (95% CI, 0.07%~0.31%) respectively.
Conclusions: Glaucoma was the main cause of blindness in the elderly population. The prevalence of primary open angle glaucoma had been increasing since 1996. The prevalence of primary open angle glaucoma is similar to that of primary angle-closure glaucoma.
References:
1. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. Br J Ophthalmol 2006; 90: 262-267. 2. Foster PJ, Buhrmann R, Quigley HA, et al. The definition and classification of glaucoma in prevalence surveys. Br J Ophthalmol 2002; 86: 238-242. 3. Raychaudhuri A, LAHIri SK, Bandyopadhyay M, et al. A population-based survey of the prevalence and types of glaucoma in rural West Bengal: the West Bengal Glaucoma Study. Br J Ophthalmol 2005; 89: 1559-1564. 4. Shah

NN, Bowd C, Felipe A, et al. Combining structural and functional testing for detection of glaucoma. Ophthalmology 2006; 113: 1593-1602. 5. Foster PJ, Johnson GJ. Glaucoma in China: how big is the problem? Br J Ophthalmol 2001; 85: 1277-1282.

P003 INTRAOCULAR PRESSURE IN EGYPTIANS ABOVE THE AGE OF FORTY

F. El-Shiaty
Cairo University, CAIRO, Egypt

Objective: Evaluation of IOP distribution in Egyptians above the age of forty.
Design: Cross-sectional study.
Participants: Individuals above the age of forty who entered the ophthalmic clinics of ten of the members of the Egyptian Society for the Glaucomas (ESG) for any complaint not related to glaucoma or elevated IOP.
Methods: IOP was measured in both eyes using the standard Goldmann applanation tonometer.
Main outcome measures: 1,841 eyes belonging to 932 individuals. The IOP ranged from 8 to 59 mmHg with a mean of 16.2 ± 4.6 mmHg.
Results: Data were corrected by excluding IOP 2 SDs away from the mean. After correction, 1796 eyes belonging to 915 individuals were included of which 465 were males and 437 females, while the gender was not specified in 13 individuals. The mean IOP was 15.7 ± 3.3 mmHg. Table 1 shows the results of the data. Figure 1 shows the IOP distribution curve which is slightly skewed to the right as found in other studies.
Considering the upper limit of normal IOP as the mean + 2 SD 1, ocular hypertension should be considered in 55 eyes (3%) where IOP is > 22 mmHg. This coincides with IOP > 97.5th percentile (table 2).
The mean IOP in males (15.3 ± 3.3 mmHg) was significantly (P = 0.0003) lower than IOP in females (15.9 ± 3.3 mmHg) (figure 2). There was only a significant difference between the mean IOP in the age group from 61 to 70 years and both the mean IOP in all individuals above the age of forty and the mean IOP in age group from 51 to 60 years (Table 3).
Conclusions: The mean IOP in Egyptians above the age of forty is 15.7 mmHg and ocular hypertension and glaucoma suspect should be considered when IOP is > 22 mmHg which satisfies both definitions of 2SD above the mean1 and > 97.5th percentile(3). Glaucoma should be considered when IOP is more than 26 mmHg which coincides with the 99.5th percentile. The mean IOP was 15.4 mmHg in males and 15.9 mmHg in females and increased to 16.1 mmHg in the 61-70 years age group. This sex and age difference is not consistent with other studies in different populations.
References:
1.Shiose Y, Kawase Y. A new approach to stratified normal intraocular pressure in a general population. Am J Ophthalmol 1986; 101: 714. 2.Hashemi H, Kashi AH, Fotouhi A, Mohammad K. Distribution of intraocular pressure in healthy Iranian individuals: the Tehran Eye Study. Br J Ophthalmol 2005; 89: 652. 3.Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys. Br J Ophthalmol 2002; 86: 238. 4.Weih LM, Mukesh BN, McCarly CA. Association of demographic, familial, medical, and ocular factors with intraocular pressure. Arch Ophthalmol 2001; 119: 875. 5.Klein BE, Klein R, Linton KL. Intraocular pressure in an American community. The Beaver Dam Eye Study. Invetst Ophthalmol Vis Sci 1992; 33: 2224.

P004 THE PREVALENCE OF GLAUCOMA IN A MALAY POPULATION IN ASIA: THE SINGAPORE MALAY EYE STUDY (SIMES)

S. Shen[1], T.Y. Wong[1], P. Foster[2], J.L. Loo[1], S.C. Loon[1], N. Ishak[1], T. Aung[1]
[1]Singapore Eye Research Institute, SINGAPORE, Singapore, [2]Institute of Ophthalmology, LONDON, United Kingdom

Purpose: To describe the prevalence and type of glaucoma in an urban Malay population.
Design and Participants: A population-based, cross-sectional study of Malays aged 40-80 years residing in Singapore. An age-stratified random sampling procedure selected 5,600 Malay names residing in south-western Singapore from the national database. Selected individuals were contacted by telephone and home visits to determine study eligibility. Eligible individuals were invited to a centralized clinic for a standardized interview, ophthalmic imaging and clinical assessment. Clinical assessment included presenting and best-corrected visual acuity, refraction, slit-lamp bio-microscopy, assessment of intraocular pressure (IOP) by Goldmann applanation tonometry and optic disc examination. Participants who were categorized as 'glaucoma suspect' received visual field examination (24-2 SITA static, threshold-related) and gonioscopy in addition to the standardized clinical assessment. Glaucoma was defined according to the international society for geographical and epidemiological ophthalmology classification.
Main outcome measures: The prevalence of various types of glaucoma in an urban Malay population.
Results: Of the 5,600 names selected, 4,168 (74.4%) were eligible for the study and a total of 3,280 had attended the centralized clinic (78.7% response rate). Of these, 363 (11.07%) were categorized as 'glaucoma suspect'. There were 157 people diagnosed to have glaucoma, resulting in a crude prevalence of 4.79% and the age-standardized prevalence of 3.6% (95% confidence intervals [CI] 3.5 to 3.6). Of all the glaucoma cases, 142 (3.26%; 95% CI, 3.17 to 3.36) were primary open angle glaucoma; (POAG), 12 (0.18%; 95% CI, 0.16 to 0.20) were primary angle closure glaucoma (PACG), 2 (0.05%; 95% CI 0.03 to 0.06) were secondary glaucoma and 1 (0.06%; 95% CI 0.05 to 0.08) was congenital glaucoma. There were altogether 198 (6.04%) glaucoma suspects.
Conclusions: This study shows that the prevalence of glaucoma among Malays in Singapore aged 40-80 years old is 4.79% and the age-standardized prevalence is 3.6%.
References:
1. The definition and classification of glaucoma in prevalence surveys. PJ Foster, R Bhurmann, HA Quigley et al. BJO 2002; 86: 238-242. 2. Prevalence and clinical characteristics of glaucoma in adult Chinese: a population-based study in Liwan district, Guangzhou. M He, P Foster, J Ge et al. IOVS 2006; 47: 2782-8. 3. The prevalence of glaucoma in Chinese residents of Singapore: a cross-sectional population survey of the Tanjong Pagar district. PJ Foster, FT Oen, D Machin et al. Arch Ophthalmol 2000; 118: 1105-

11. 4. Prevalence of open-angle glaucoma in Australia. The Blue Mountains eye study. P Mitchell, W Smith, K Attebo et al. Ophthalmology 1996; 103: 1661-9. 5. Prevalence of glaucoma. The Beaver Dam Eye study. BE Klein, R Klein and KL Linton. Ophthalmology 1992; 99: 1499-504.

P005 EPIDEMIOLOGICAL PROFILE OF PRIMARY ANGLE CLOSURE IN A TERTIARY CARE CENTRE IN NORTH INDIA

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PGIMER, CHANDIGARH, India

Objective: To study the demographic and clinical profile of the subtypes of primary angle closure patients presenting at a tertiary care centre in North India.
Design: A retrospective case series.
Participants: All patients diagnosed as primary angle closure presenting to glaucoma services of our institute during January 2000 to June 2006.
Methods: Clinic records were reviewed and patients were classified into primary angle closure suspects (PACS), primary angle closure (PAC), and primary angle closure glaucoma (PACG) according to Foster's classification. Occludable angles were defined as non-visibility of the posterior pigmented trabecular meshwork in > 3 angle quadrants.
Main outcome measures: Age, sex, symptomatology, best corrected visual acuity, intraocular pressure, gonioscopy,optic disc assessment and visual field defects.
Results: Two hundred fifty-three patients (495 eyes) (males: 112, females: 141) met the inclusion criteria. Mean age (in years) at presentation was 54.70 (males: 56.49 years; females: 52.92 years). Urban patients (63.6%) were predominant. PACS was seen in 73 eyes (14.71%), PAC in 287 eyes (57.86%) and PACG in 135 eyes (27.27%). Diminution of vision (60.86%) and a nonspecific headache (51.38%) were common presenting complaints. Coloured haloes were reported by only 45 (17.7%) patients. Eighteen patients (7.11%) presented with an acute attack. Four hundred thirty-five eyes [87.87%] had a best corrected visual acuity of better than 20/200. Mean intraocular pressure at presentation was 17.93 mmHg in eyes that had received prior medical therapy and 17.52 mmHg in remaining eyes. Ninety-one patients (35.96%) had received medical therapy prior to referral. Surgical iridectomy or laser iridotomy was noted in 8 eyes (1.61%) and 34 eyes (6.86%) respectively, prior to referral. Eighty-three eyes (16.76%) had closed angles in all quadrants, and 269 eyes (54.34%) had occludable angles. Eighty-four eyes (62.6%) amongst primary angle closure glaucoma, presented with advanced glaucomatous damage. Advanced glaucomatous optic neuropathy (cup-disc ratio >0.8) was seen in 71 eyes (14.34%).Visual fields were done for patients with best corrected visual acuity of 20/200 or above, 33 eyes (6.66%) showed advanced field defects (md >12db).
Conclusion: Primary angle closure is a common entity in North India and shows a female preponderance. More than half of PACG presented with advanced disease. Majority are chronic ACG, which is largely undetected.
References:
1. Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys.Br J Ophthalmol 2002; 86: 238-4. 2. Congdon N, Wang F, Tielsch JM. Issues in the epidemiology and population based screening of primary angle closure glaucoma. Surv Ophthalmol 1992; 36:411-23. 3. Lowe RF. Clinical types of primary angle closure glaucoma. Aust NZ J Ophthalmol 1988; 16: 245-50. 4. Sihota R, Agarwal HC. Profile of the subtypes of angle closure glaucoma in a tertiary hospital in North India. Indian J Ophthalmol 1998; 46: 25-9. 5. Shaffer RN. A suggested anatomic classification to define the pupillary block glaucomas. Invest Ophthalmol 1973; 12: 540-42.

P006 POPULATION PREVALENCE OF TILTED OPTIC DISCS IN AN ADULT CHINESE POPULATION IN SINGAPORE: THE TANJONG PAGAR SURVEY

C.S. How[1], G. Tan[1], S. Seah[1], P. Foster[2], T. Aung[1]
[1]Singapore National Eye Centre, SINGAPORE, Singapore, [2]Institute of Ophthalmology, LONDON, United Kingdom

Objective: Singapore has one of the highest myopia prevalence worldwide. There are many optic disc changes associated with myopia, such as tilted optic discs. We aimed to determine the prevalence of tilted optic discs and its relationship with myopic refractive error and axial length in adult Chinese individuals in Singapore.
Design: This study was a population-based, cross-sectional survey.
Participants: We studied 488 Chinese adults aged 40 to 81 years residing in Tanjong Pagar district, Singapore.
Methods: Axial ocular dimensions were measured using an a-scan ultrasound device. Noncycloplegic refraction was measured with an autorefractor and further refined subjectively. Colour optic disc stereophotographs were taken with a mydriatic fundus camera. From the disc photographs, maximum, minimum, vertical and horizontal disc diameters were measured. The angle of tilt was also measured and defined as the angle between the maximum disc diameter and the horizontal disc diameter. All measurements were made with the bersoft image measurement software. (version 5.0, Buenos Aires, Argentina)
Main outcome measures: Disc ovality was assessed using the ratio of minimum to maximum disk diameter (index of tilt) a tilted optic disc was defined as a disc with an index of tilt less than 0.75 as in previous studies.
Results: Four hundred eighty-eight subjects had their optic disc parameters measured, and their mean age was 58.8 +/-11.1 years. The prevalence of tilted optic discs was 2.9%. The mean tilt ratio was 0.881 +/- 0.064. The mean spherical equivalent was0.39 +/-2.77 dioptres and the mean axial length was 23.14 +/- 1.32 mm. Greater index of tilt correlated with greater myopia ($p<0.01$) and greater axial length ($p<0.01$). Tilted discs were present in 20.8% of eyes with myopia compared with 5.9% of eyes with no myopia ($p<0.01$). Age did not have any significant association with tilt ratio or the prevalence of tilted disc.
Conclusion: Tilted optic disc was a fairly common finding in the adult Chinese population. Optic disc tilt was strongly associated with myopia and axial length.
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P007 GLAUCOMA IN FIRST DEGREE RELATIVES

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Purpose: Primary open angle glaucoma (POAG) is known to demonstrate a hereditary pattern. The pattern and severity of POAG among first degree relatives were evaluated and compared.
Design: A cohort study of patients with POAG, followed up in our service, and their first degree relatives, was conducted.
Participants: Seventeen pairs of first degree relatives (16 parent/child and 1 pair identical twins) with OAG were reviewed.
Methods: The pattern of glaucoma within each pair of family members was compared, with regard to the type of glaucoma (ocular hypertension (OHT), OAG or normal tension glaucoma (NTG), age at diagnosis, and the amount of glaucomatous damage evaluated by optic disc excavation and glaucomatous visual field defects (GVFD). Visual field damage severity was quantified: 0 (normal vf), 1-mild (superior/inferior actuate / nasal step), 2 (2 GVFD) and 3 severe (more than 2 GVFD). This study was approved by the institutional review board (IRB).
Main outcome measures: Age at diagnosis, mean cup disc ratio and GVFD and OAG type.
Results: Mean age at diagnosis in the parent group was 73.3 (range 66-80) and 47.3 (range 32-60) in the child group ($p<0.01$). Mean cup-disc ratio was 0.78 in the parent group and 0.55 in the child group ($p<0.01$). Calculated VF damage severity was is 1.43 in the parent group and 0.96 in the child group. Amongst the parents 13 had OAG and 3 NTG, and among the children 2 OHT, 11 OAG and 3 NTG. As for the twins, one has OAG and the other NTG.
Conclusions: First-degree relatives may have high-pressure OAG, NTG or OHT among the members of the same family. They should be screened for glaucoma at a relatively young age, since POAG in the second generation might commence earlier and may result in more significant damage at the time of diagnosis.
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P008 GLAUCOMA PREVALENCE IN THE AFROCOLOMBIAN POPULATION OF QUIBD, COLOMBIA

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Purpose: To estimate glaucoma prevalence in a native afrocolombian population.
Design: Population-based, cross sectional study.
Participants: Nine hundred seventy-seven Afro-Colombian individuals from the town of Quibd', Colombia.
Methods: The study was divided in two phases. In the first phase 977 individuals were screened for glaucoma. Analysis of the first phase resulted in 320 glaucoma suspects (IOP above 21 mmHg, and/or optic disc with suspicious cupping) who were included in the second phase. This phase was developed by two glaucoma specialists and two ophthalmology residents who traveled and transported all equipment to Quibd' in the Pacific Colombian region. Evaluation included slit lamp exam, IOP measurement, gonioscopy, optic disc evaluation, and ultrasound pachymetry. Frequency doubling perimetry was performed in glaucoma suspects. Results were analyzed with SPSS.
Main outcome measures: Prevalence of glaucoma, IOP, pachymetry, optic disc damage.
Results: Prevalence of glaucoma was estimated in 5.3%. Of the 320 individuals evaluated in the second phase, 66.6% were females, and mean age of 55 years. Glaucoma was confirmed in 16.3%, 21.6% were considered glaucoma suspects and 62.1% were non glaucomatous. Glaucoma suspects were classified as ocular hypertensives 2.8%, and suspicious cupping 18.8%. The confirmed glaucoma group had mean IOP of 25.3 mmHg (sd ± 10), mean pachymetry ± 505 µ (sd 34.5), and mean optic disc cupping of 0.7 (sd ± 0.2). The ocular hypertensives had mean IOP of 27.2 (sd ±4.2), mean pachymetry 523.7µ (sd ± 33.6) and mean optic disc cupping of 0.3 (sd ±0.1). The suspicious cupping group had mean IOP of 15.1 mmHg (sd ± 15.5), mean pachymetry 500.6µ (sd ± 38.6) and mean optic disc cupping of 0.6 (sd ± 0.1). Glaucoma patients were older than suspects and non glaucomatous. There was an inverse relation between age and pachymetry in the glaucoma and non-glaucoma groups ($p<0.000$).
Conclusions: Glaucoma has 5.3% prevalence in the Afro-Colombian population. Blindness from glaucoma was found in 6.7%, and 13.1% reported positive family history of glaucoma. The lack of health coverage in an underdeveloped community makes it a major public health concern in the country.
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P009 SIZE OF THE NEURORETINAL RIM AND OPTIC CUP AND THEIR CORRELATIONS WITH OCULAR AND GENERAL PARAMETERS IN ADULT CHINESE. THE BEIJING EYE STUDY

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Objective: Since the neuroretinal rim is the major parameter in the quantitative analysis of the optic nerve head, it was the purpose of the present study to measure its size and correlations in adult Chinese in a population-based setting.
Design: A population-based, cross-sectional cohort study.
Participants: The Beijing Eye Study included 4439 subjects out of 5324 subjects invited to participate (response rate 83.4%) with an age of 40+ years.
Methods: The present study included a random sample of 781 subjects with normal intraocular pressure (IOP), normal visual field and a normal optic nerve head; and 84 subjects with an IOP > 21 mmHg. Color optic disc photographs (30°) were morphometrically examined. The optic disc photographs were digitized and the optic disc structures were measured by outlining their borders. We measured the optic disc, optic cup on the computer screen.
Main outcome measures: Neuroretinal rim area and optic disc area.
Results: In the normal group, neuroretinal rim measured 1.70 ± 0.30 mm^2 (median: 1.67 mm^2; range: 0.91 to 3.20 mm^2). It was significantly correlated with optic disc area (rim area = 0.43 * disc area + 0.67; r=0.68, p<0.001). It was not significantly associated with age, gender, and the known diagnosis of diabetes mellitus, arterial hypertension, arterial hypotension, hyperlipidemia, coronary heart disease, and cerebral hemorrhage. Taking the whole study group, neuroretinal rim significantly decreased with increase of intraocular pressure (r=-0.34, p>0.001).
Conclusions: In adult Chinese, the neuroretinal rim area measures on optic disc photographs 1.70 ± 0.30 mm^2. It is statistically independent of age and decreases with increase of intraocular pressure.
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P010 DETERMINANTS OF OPTIC CUP TO DISC RATIO (CDR) IN AN ASIAN POPULATION: THE SINGAPORE MALAY EYE STUDY (SIMES)

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Purpose: To describe the distribution and determinants of optic cup to disc ratio (CDR) in Malay adults in Singapore.
Design: population-based cross-sectional study.
Participants: 3,280 Malay adults aged 40'80 years in Singapore.
Methods: An age-stratified, random sampling procedure was used to select Malay people aged 40-80 years living in the south-western part of Singapore1. Participants had a standardized interview, examination and ocular imaging at a centralized study clinic. The optic disc was examined at the slit lamp using a +78 diopter lens at x10 magnification. The vertical dimensions of the disc and cup were measured using a fixed graticule in the eyepiece. Measurements of vertical disc diameter excluded areas of peripapillary atrophy and Elschnig's ring. The margins of the cup were defined by stereoscopic examination as the point of maximum inflexion of contour. The height of the cup was measured as the vertical distance between the points of maximal centrifugal extension of the cup between 11 to 1 o'clock, and 5 to 7 o'clock.
Main outcome measures: Vertical optic cup to disc ratio (CDR).
Results: Vertical CDR was recorded for 3228 right eyes. The mean (standard deviation) of CDR was 0.40 (0.15). CDR increased with age (p<0.001) and after controlling for age, was greater in men than women (0.42 vs. 0.39, p<0.001). Vertical CDR was significantly correlated with intraocular pressure (Pearson's correlation coefficient 0.105, p<.0001). In multivariable linear regression, significant determinants of greater CDR were increasing age, male gender, lower diastolic blood pressure, lower body mass index, lower total cholesterol, higher LDL-cholesterol, higher intraocular pressure, shorter anterior chamber depth, and previous cataract surgery. Among these factors, intraocular pressure was the most important determinant of CDR, in agreement with previous studies.
Conclusions: This population-based study shows that a greater CDR is related to increasing age, male gender, higher levels of intraocular pressure, shorter anterior chamber depth and prior cataract surgery.

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P011 PREVALENCE OF DISC HEMORRHAGE IN A POPULATION-BASED STUDY IN JAPAN

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Objective: Optic disc hemorrhage (DH) is one of the most important risk factors for progression of glaucoma. DH is reportedly observed more frequently in normal-tension glaucoma (NTG) than in primary open angle glaucoma and prevalence of NTG is as high as 3.6% in Japan. We investigated prevalence of DH and its relating systemic and ocular factors in participants of the Tajimi Study, a population-based glaucoma survey in Japan.
Design: A cross-sectional epidemiologic population-based study.
Participants: Subjects randomly selected from the population older than 40 years in Tajimi City.
Methods: 3021 out of eligible residents (78.1%) underwent the screening examinations including non-mydriatic fundus photographs. When ocular disease were suspected, the subjects were referred to definitive examinarion. Subjects were grouped 'definitive glaucoma', 'glaucoma suspect' and 'non-glaucoma'. All fundus photographs were reviewed by one experienced examiner (IA) to determine the presence of DH. To decide factors associating with DH other than glaucoma in non-glaucoma subjects, the relating factors were studied using logistic analysis with stepwise selection in which the independent variable was the presence of DH and the dependent ones were sex, age, mean blood pressure, height, weight, refractive error, intraocular pressure, central corneal thickness, optic disc area, presence of parapapillary atrophy (PPA)-alpha, and area of PPA-beta.
Main outcome measures: Prevalence of disc hemorrhages.
Results: Fundus photographs with sufficient quality were available in 2911 subjects. DH was found in at least one eye in 36 subjects (prevalence = 1.2%, 95% confidence interval 0.9 - 1.6%), including 19 of 145 subjects with definitive glaucoma (prevalence 13.1%), 7 of 74 with glaucoma suspect (9.5%), and 10 of 2692 non-glaucoma subjects (0.4%). Prevalence of DH was significantly different among the 3 groups (p<0.001, chi-square test). The logistic analysis revealed that higher age (p<0.001) and larger area of PPA-beta (p=0.040) were significantly associated with the presence of DH in non-glaucoma subjects.
Conclusions: Prevalence of DH in a Japanese population aged 40 or older in Tajimi was 1.2%. DH was found approximately 30 times more frequently in subjects with definitive glaucoma than in non-glaucoma subjects. Other than glaucoma, higher age and greater area of PPA-beta were significantly associated with DH.
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P012 CENTRAL CORNEAL THICKNESS IN ADULT CHINESE. THE BEIJING EYE STUDY

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Objectives: To evaluate the distribution of central corneal thickness (CCT) and its associations in the adult Chinese population.
Design: Population-based study.
Participants: The Beijing eye study 2006 is a population-based study including 3251 (73.3%) subjects (aged 45+ years) out of 4439 subjects who participated in the survey 2001 and who returned for re-examination.
Methods: CCT measurements were performed by slit lamp optical coherence tomography in 2006. All subjects received a standardized examination, including visual acuity, intraocular pressure, central corneal thickness, refraction status, fundus phtograghs, a detailed questionnaires and a comprehensive ophthalmologic evaluation.
Main outcome measures: Central corneal thickness (CCT).
Results: CCT measurement data were available for 3100 (95.4%) subjects. CCT was significantly associated with male gender (p=0.004; males:559.6±32.7um; females:553.8±33.4 um) and urban region (p<0.001; urban region:558.7±33.5 um; rural region:552.7±32.5um). Intraocular pressure (measured by pneumotonometry) increased for each um CCT increase by 0.03 mmHg. CCT was not significantly associated with age (p=0.13), refractive error (p=0.05), cylindrical refractive error (p=0.65), body weight (p=0.07) and body height (p=0.63).
Conclusions: In the adult Chinese population, CCT is related with male gender and urban region. It is not associated with age and refractive error.
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P013 PREVALENCE OF PSEUDOEXFOLIATION AND PSEUDOEXFOLIATION GLAUCOMA IN AN URBAN POPULATION: THE CHENNAI GLAUCOMA STUDY

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Purpose: To report the prevalence of pseudoexfoliation and pseudoexfoliation glaucoma in the urban cohort of the Chennai Glaucoma Study.
Design: Population-based cross-sectional study.
Participants: 3850 of 4800 (80.2%) enumerated subjects from 5 randomly selected areas of Chennai City were examined.
Methods: They underwent Goldmann applanation tonometry, gonioscopy, dilated lens evaluation, stereoscopic optic disc photography, pachymetry and frequency doubling perimetry. Humphrey visual fields 30-2 were used to confirm the diagnosis. Glaucoma was diagnosed based on the ISGEO criteria.
Main outcome measures: Presence of pseudoexfoliation or pseudoexfoliation glaucoma.
Results: Pseudoexfoliation was seen in 85 (2.21%; 95%ci: 1.75,2.67) persons. Of these 7 (4 males, 3 females) (8.24%; 95%CI: 2.4, 14.1) were diagnosed to have glaucoma. Subjects with PXF were significantly (p=0.0001) older (68.0(sd:10.3yrs) compared to normal 54.6 yrs (sd: 8.6)). There was a male preponderance 51:34 (p=0.003). Pseudoexfoliation was bilateral in 38 (44%) cases and unilateral in 47 (56%). Subjects with pseudoexfoliation had a lower body mass index (BMI) (22.2(sd3.6)) as compared to normals (24.8(sd:4.6) (p=0.0001, 95%ci of the difference:1.6-3.6). The odds ratio for ocular hypertension among those with PXF was 3.71 (95%CI: 2.0,6.9) compared to those without disease.
All subjects with pseudoexfoliation glaucoma had open angles on gonioscopy. They were significantly older and had lower bmi than normals. Those with pseudoexfoliation glaucoma were similar in age and gender distribution to those with pseudoexfoliation. The prevalence of pseudoexfoliation was significantly lower in the urban population as compared to the rural population (3.8%) reported earlier.
Conclusions: 2.2% of the urban cohort had pseudoexfoliation, significantly lower than that seen in rural cohort.
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P014 OCULAR BIOMETRIC RISK FACTORS FOR ANGLE CLOSURE DISEASE

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Purpose: To assess the influence of biometric factors on angle closure disease in a population-based study (Chennai Glaucoma Study).
Design: Population-based case control.
Participants: Six hundred seventy-nine subjects with angle closure disease and 1223 randomly selected controls from rural and urban South India.
Methods: They underwent Goldmann applanation tonometry, gonioscopy, stereoscopic optic disc photography, pachymetry, ultrasound biometry and frequency doubling perimetry. Humphrey visual fields 30-2 were used to confirm the diagnosis. Glaucoma was diagnosed based on the ISGEO criteria. The ocular biometric variables were divided into 10 equal groups for comparison. The right eye was used for analysis.
Main outcome measures: Comparison of axial length (AXL), anterior chamber depth (ACD), lens thickness (LT), lens position (LP) and relative lens position (RLP).
Results: Of the 679 subjects with angle closure disease 488 were primary angle closure suspects (PACS), 130 had primary angle closure and 61 had primary angle closure glaucoma (PACG). Subjects with angle closure disease were significantly older (p=0.0001) than normal. They had shorter axial lengths 22.15 (SD: 0.77 (p=0.0001)) , shallower ACD 2.48 (SD: 0.3, p=0.0001), more anterior lens position 4.67 (SD: 0.51, p=0.0001) and relative lens position 2.1 (SD: 0.23, p=0.0001) as compared to normal - AXL: 22.82 (SD: 0.94), ACD: 2.94 (0.31), LP 5.14 (0.29) and RLP 2.25 (0.13) respectively. The odds ratio for angle closure disease in the cohort with the shortest axial length compared to the cohort with the longest axial length was 19.4 (95%CI: 11.2, 33.7); for relative lens position odds ratio for the most anterior cohort was 22.5 (13.0, 39.0) and for the most anterior lens position was 100 (47.1,212.3).
Conclusions: Eyes with angle closure disease were shorter than normal eyes, anterior lens position was strongly associated with angle closure disease.
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P015 PREVALENCE OF GLAUCOMA IN THE ADULT CHINESE POPULATION. THE BEIJING EYE STUDY

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Purpose: To assess the prevalence of open-angle glaucoma in adult Chinese.
Design: Cross-sectional prevalence study in defined populations.
Participants: The Beijing Eye Study included 4439 subjects out of 5324 subjects invited to participate (response rate 83.4%) with an age of 40+ years. The present investiGATion consisted of 8700 eyes (98.0%) of 4356 (98.1%) subjects for whom readable fundus photographs were available.
Methods: The participants underwent an interview and a detailed ophthalmic examination including frequency doubling perimetry, pneumotonometry, anterior chamber depth assessment, gonioscopy, and fundus photography.
Main outcome measures: Prevalence of glaucoma as defined by the appearance of the optic nerve head, independent of intraocular pressure. In open-angle glaucoma, the anterior chamber angle was open and the anterior chamber depth normal. In angle-closure glaucoma, the chamber angle was either occluded by 15° or the peripheral anterior chamber depth was <1/4 of the corneal thickness.
Results: From the 4439 individuals, readable optic disc photographs were available for 4356 (98.1%) subjects (8700 eyes). Glaucoma was detected in 220 eyes (prevalence rate per eye 2.5 ± 0.168% (mean ± standard error) (95% coNFIdence interval (CI): 2.17, 2.84) of 136 subjects (3.1 ± 0.264; 95%ci: 2.58, 3.62). The frequency of glaucomatous optic neuropathy increased significantly with age (p<0.001). The prevalence rates of glaucoma for the age groups of 40 to 49 years, 50 to 59 years, 60 to 69 years, and 70+ years, respectively, were 1.0%, 1.6%, 4.1%, and 11.3%, respectively. The prevalence of glaucomatous optic neuropathy was not associated with gender (p=0.281), and rural region versus urban region (p=0.293). It increased significantly with increasing myopic refractive error (p<0.001). Out of the 136 glaucoma subjects with glaucomatous optic nerve damage, 97 (71%) were classified as open-angle glaucoma, and 39 (29%) as angle-closure glaucoma.
Conclusions: The prevalence of glaucomatous optic neuropathy as defined by the appearance of the optic nerve head was found in 3.1% subjects and increased significantly with age. The prevalence rate is comparable with figures from Caucasian populations, and in agreement with recent studies in Asian population groups that angle-closure glaucoma is less common than open-angle glaucoma in the beijing eye study. Blindness and low vision caused by PACG is more severe than that caused by POAG.
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P016 RETINAL VESSEL DIAMETER AND ITS ASSOCIATION WITH OPEN-ANGLE GLAUCOMA. THE BEIJING EYE STUDY

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Purpose: To describe the distribution of the retinal vessel diameter in Beijing Eye Study (BES) and to examine the relationship between open-angle glaucoma (OAG) and retinal vessel diameter among baseline participants in the Beijing Eye Study.
Design: Population-based cross-sectional study.
Participants: The study included 4439 subjects out of 5324 subjects invited to participate (response rate: 83.4%) with an age of 40+ years.
Methods: Participants had a detailed eye examination, including stereo optic disc photography. Color optic disc photographs were morphometrically examined. One eye of each participant was randomly selected. A computer-assisted program measured retinal vessel diameters from digitized photographs of selected eyes.
Main outcome measures: Open-angle glaucoma was diagnosed from matching visual field defects and optic disc cupping, without reference to intraocular pressure (IOP) level. Ocular hypertension was defined as IOP >21mmHg, without matching glaucomatous optic disc and field changes. Average retinal vessel diameters were summarized as central retinal artery equivalent (CRAE) and central retinal vein equivalent (CRVE). The lowest quintile of CRAE or arteriole-to-venule ratio was used to define generalized retinal arteriolar narrowing.
Results: Means and standard deviation of CRAE, CRVE, and AVR were 149.79 ± 13.41, 223.35 ± 19.36, and 0.67 ± 0.06 in elderly Chinese in Beijing. The study included 4047 participants, after excluding those with incomplete data, PACG or nonglaucomatous optic nerve diseases. Of persons included, there were 70 eyes with open-angle glaucoma, 149 eyes with ocular hypertension. Eyes with glaucomatous damage had significantly narrower retinal arteriolar diameters (137.18 ± 16.07 microm) than eyes without glaucoma (150.12 ±13.21 microm, p < 0.001) or eyes with ocular hypertension (150.24 ± 13.12 microm, p <0.001), after adjusting for age, hypertension histories, and other confounding variables, including refraction, gender, age and area, eyes with glaucomatous damage were at least 2 times more likely to have generalized retinal arteriolar narrowing than eyes without glaucoma (odds ratio, 2.578; 95% confidence interval, 1.076-6.178).
Conclusions: AVR is smaller in elderly Chinese than in

elderly western population, and it is smaller in rural population than in urban ones. Males have thinner arterioles than female. These population-based data suggest that generalized retinal arteriolar narrowing, an indicator of localized vascular change, is associated with optic nerve damage caused by OAG.

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P017 FACTORS ASSOCIATED WITH UNDIAGNOSED OPEN ANGLE GLAUCOMA (OAG) IN A POPULATION-BASED SETTING: THESSALONIKI EYE STUDY

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Objective: To present the factors associated with previously undiagnosed OAG, as it was identified during the TES examination process.

Design: Cross sectional population-based study.

Methods: Randomly sampled people aged 60 years and older from the municipality registries of the city of Thessaloniki were invited to participate in the Thessaloniki Eye Study (TES) in which an extensive ophthalmic examination was performed by trained ophthalmologists. Primary open angle glaucoma (POAG) and pseudoexfoliative glaucoma (PEXG) were defined according to specific criteria. Undiagnosed glaucoma was defined as a negative response on all of the following questions which were administered to the participants: history of prior diagnosis of glaucoma, history of prior diagnosis of ocular hypertension, history of medical treatment for glaucoma and history of prior glaucoma surgery.

Main outcome measures: In the regression analysis models of factors associated with undiagnosed OAG the following parameters were included: age, gender, visual acuity, vertical c/d ratio, higher IOP between the two eyes, AGIS visual field score, family history of glaucoma, history of cataract surgery, last time saw an eye doctor and type of glaucoma (POAG vs PEXG)

Results: PEXG compared to POAG were three times less likely to present undiagnosed (or: 0.27, ci: 0.08-0.95). Glaucoma subjects which had not seen an ophthalmologist for more that one year from the examination were 6 times more likely to be undiagnosed than glaucoma subjects which had visited an ophthalmologist during the last year (or: 5.9, ci: 1.77-19.6).

Conclusions: Various population-based studies reported significant high rates of undiagnosed glaucoma cases in the developed countries. POAG compared to PEXG is three times more likely to be undiagnosed. The lack of diagnosis may also be related with the frequency of visiting an eye professional.

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P018 FREQUENCY DISTRIBUTION OF VARIOUS TYPES OF GLAUCOMA IN NEWLY DIAGNOSED PATIENTS IN THE WESTERN REGION IN SAUDI ARABIA: A HOSPITAL-BASED STUDY

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Purpose: To determine the frequency distribution of various types of glaucoma in patients of the western region of Saudi Arabia on their first visit examination to a private practice primary eye care and ophthalmic surgery referral center.

Study Design: Systematic, chart-review analysis.

Participants: Patients with glaucoma or suspected glaucoma diagnosis during their first visit examination to the glaucoma and cataract unit and evaluated by the first author from January till December 2006.

Methods: Glaucoma diagnosis was based upon clinical evaluation including personal and family history, slitlamp examination of the anterior segment, fundus and gonioscopy, applanation tonometry at various times of the day, and ± automated or manual field test, pachymetry, disc photography, and optical coherence tomography.

Main outcome measures: Frequency distribution of various types of glaucoma in newly diagnosed patients. Other outcome measures include mean age and IOP at time of diagnosis, legal blindness, and status of follow-up after first visit examination.

Results: A diagnosis of glaucoma or glaucoma suspect was seen in 553 of 1860 new patients examined in the

cataract and glaucoma unit in 2006. Mean age was 55.6 ± 15.8 years, mean IOP was 25.1 ± 14.2 mmHg, and mean visual acuity was 0.4 ± 0.6 in both eyes. Males were 56.9% and racial distribution was 71.0% saudi, 13.7% black African, 7.6% Caucasian, and 6.7% Asian. Unilateral glaucoma diagnosis was seen in 22.2% of cases. Frequency distribution of various types of glaucoma is shown in table 1. No light perception was noticed in 46 (8.2%) right and 46 left eyes whereas unilateral legal blindness was seen in 35.5% of cases and bilateral legal blindness in 9.6%. Approximately one-third of patients (35.5%) did not show up after first examination compared to 33.5% with regular visits and 30.7% with inconsistent follow-up.
Conclusion: Primary open-angle and narrow-angle glaucomas were equally distributed in a hospital-based survey of newly diagnosed glaucoma patients in the western region of Saudi Arabia.
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1.2. General aspects: Population genetics

P019 HERITABILITY OF INTRAOCULAR PRESSURE IN CHINESE SCHOOL-AGED CHILDREN: GUANGZHOU TWIN EYE STUDY

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Purpose: To assess the heritability of intraocular pressure (IOP) in Chinese children.
Design: Classic twin study.
Participants: Three hundred fifty-nine monozygotic and 202 dizygotic twin pairs aged 7 to 15 years identified from Guangzhou twin registry and being eligible for IOP analysis.
Methods: Guangzhou twin registry was established in 2005. Twins living in two districts closest to the examination station were recruited from this registry. IOP was measured using a tonopen tonometer at the same time for each specific twin pairs. Zygosity was confirmed by genotyping with 16 polymorphic markers in all same-sex twin pairs. The outcomes of the right eye were in analysis. All twin pairs with retinopathy of prematurity, other congenital eye diseases or missing data on IOP were excluded. Heritability was assessed by structural variance component genetic modeling using MX software.
Main outcome measures: Intraocular pressure.
Results: The mean age of the subjects was 10.8±2.6 years (range 7-15 years). Mean IOP was 16.2 mmHg (sd: 2.7) in the elderly twin. IOP increased with age (linear regression, coefficient=0.11, p=0.014) but not associated with sex (p=0.68). Intraclass correlation coefficients were 0.71 in mz and 0.39 in dz twins (p<0.0001). The variance component model identified 70.6% additive genetic (95%CI: 65.4~74.9%) and 29.4% unique environment (95%CI: 25.1~34.6%) being best fit.
Conclusions: Intraocular pressure increases with age but not associated with gender. In children IOP is highly determined by genetic variation.
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1.3. General aspects: Pathogenesis

P020 OPEN-ANGLE GLAUCOMA: AN OCULAR ALZHEIMER'S DISEASE?

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Purpose: To determine whether primary open-angle glaucoma (POAG), including normal tension glaucoma, is associated with Alzheimer's disease (AD).
Design: Danish, nationwide, case register linkage study, 1977 to 2001.
Main outcome measures: Rate of subsequent AD in POAG patients compared to the rate in 4 control groups.
Methods: 410.544 patients were investigated with 1449 cases of AD, but without significant difference in the rate of AD between the groups (rate ratio's, table 2).
Results: POAG was not associated with increased risk of developing AD.

1.4. General aspects: Quality of Life

P021 A CORRELATION STUDY OF VISUAL FUNCTION AND HEALTH-RELATED QUALITY OF LIFE IN GLAUCOMA PATIENTS

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Objective: The purposes of this study were to explore possible factors associated with glaucoma patients' quality of life, and to evaluate the relationship between visual function and patients' perception of their health related QoL as well as vision related QoL.

Methods: The study sample was 280 patients with glaucoma undergoing follow-up in two branches of a regional hospital in Taipei from April 1, 2005 to September 30, 2005. Demographic data, clinical characteristics and the status of treatment were collected. The questionnaire used to investigate the health related QoL contains the Taiwan (Chinese) versions of sf-36 and neivfq-25 modules for visual related quality of life.
Results: Part of demographic, clinical characteristics and status of treatment of glaucoma patients were associated with their health-related QoL. Eight subscales of sf-36 and 12 subscales of neivfq-25 were negatively correlated with 6 variables of visual function. Nine of the subscales of neivfq-25 were moderately correlated with those variables of visual function (r=-0.4 to-0.69), and 2 subscales of sf-36 were moderately correlated with those variables of visual function(r=-0.4 to-0.69).
Conclusion: Results of sf-36 and neivfq-25 of glaucoma patients can be used to estimate their quality of life. The results can be used as a reference when adjusting therapy for glaucoma.
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P022 DEPRESSION AND QUALITY OF LIFE IN PATIENTS WITH GLAUCOMA-RELATED VISUAL FIELD IMPAIRMENT: A CROSS-SECTIONAL ANALYSIS USING THE GERIATRIC DEPRESSION SCALE-15 AND THE GLAUCOMA QUALITY OF LIFE-15

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Purpose: To determine the prevalence of depression and its association with visual field impairment, and quality of life in elderly patients with glaucoma.
Design: Cross-sectional study.
Participants and controls: Participants were English-speaking patients with glaucoma older than 60 attending the practice of one author (ig). Severity was stratified into mild (n=14), moderate (n=6) or severe (n=3) according to visual field loss. Controls (n=7) were age-matched patients attending the practice who did not have glaucoma.
The data from 180 participants are pending.
Methods: The geriatric depression scale-15 (GDS-15) and the glaucoma quality of life-15 (GQL-15) questionnaires were interviewer administered and scored according to their protocols. Snellen visual acuity, visual field loss and demographic data were also recorded. Statistical tests included non-parametric student t-test, Kruskal-Wallis analysis of variance, and chi-square tests.
Main outcome measures: GDS-15 scores, GQL-15 summary and subfactor scores, Nelson and Bascom Palmer glaucoma severity, visual acuity, visual fields (mean deviation (MD), pattern standard deviation (PSD) and visual fields <10db missing), treatment history, age and demographic data were collected.
Results: From this small sample, compared with controls, patients with glaucoma had significantly poorer MD and PSD scores and a greater number of missing visual fields. Other differences may become significant with greater power. Mean GDS scores differed non-significantly when glaucoma patients were stratified according to severity.
Conclusions: Based on this sample, depression is not more prevalent in elderly patients with glaucoma when compared with elderly patients with other ocular illnesses. Impaired visual fields have not been shown to affect quality of life or prevalence of depression.
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P023 UTILITY VALUES IN CHINESE GLAUCOMA PATIENTS WITH MODERATE TO SEVERE VISUAL FIELD DEFECT

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Purpose: To evaluate utility values and associated quality of life (QoL) in glaucoma patients with moderate to severe visual defect in Chinese.
Design: Cross-sectional study.
Participants: Thirty-five primary open angle glaucoma (POAG) or primary angle closure glaucoma(PACG) patients with moderate to severe visual defect were enrolled in this study (mean deviation (MD) in the better eye was less than 6db).
Methods: Face to face interviews were performed to obtain the utility values by means of time trade off (TTO), standard gamble, and rank scale methods. General information, such as age, gender, familial history and educational level, and ocular information, including current visual acuity, intraocular pressure, cup to disc ratio, MD of visual field examination were also recorded.
Main outcome measures: Utility values of TTO, standard gamble, and rank scale methods.
Results: The mean utility values of Chinese glaucoma patients with moderate to severe visual defect were 0.760 (SD 0.135; 95% confidence interval (CI), 0.718 to 0.803) with TTO method, 0.771 (SD 0.181; 95% CI, 0.714 to 0.828) with standard gamble method for a gamble of blindness, and 0.664(SD 0.171; 95% CI, 0.610 to 0.718) with rank scale method. The utility values obtained by rank scale method was lower than that obtained by the former two methods (p=0.002, p=0.001 respectively). There was no significant difference in utility values between different gender, educational level (normal education or primary education compared to postgraduate education), and surgery history. Both POAG and PACG patients had similar utility values. Patients with better eye visual field md>-12db always got a higher utility value in standard gamble and rank scale methods compared to those with md<-12db. Younger patients were more willing to trade time than older patients (pearson correlation index=-0.353, p=0.038).
Conclusions: TTO and standard gamble methods have similar effect in evaluate the quality of life in Chinese glaucoma patients with moderate or severe visual field defect. Utility value is associated with age and visual field defects in the better eye, but not the gender, educational level, surgery history, and the type of glaucoma.
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P024 QUALITY OF LIFE IN PATIENTS WITH GLAUCOMA: A COMPARISON OF TIME TRADE OFF AND CONJOINT ANALYSIS

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Objective: To investigate the impact of visual field loss on quality of life for a group of people with glaucoma.
Design: Prospective evaluation of a cohort of patients.
Participants: Patients with glaucoma attending an academic department of ophthalmology.
Methods: Quality of life was assessed using conjoint analysis and time trade off questionnaires. The conjoint task involved comparisons between 5 attributes (reading; outdoor mobility; problems with glare or darkness; bumping into things; household chores) that had emerged from a principal component analysis of a questionnaire, and three levels ('none', 'a few', or 'a lot' of problems). Clinical data included binocular integrated visual fields (IVF) with Humphrey perimetry and visual acuity.
Main outcome measures: Quality of life.
Results: 72 patients, with mean age 71.8 (+ 10.9) years, were included.
A) The relative importance of the attributes showed that reading had highest priority followed by outdoor mobility. Third in the list was darkness and glare followed by bumping into objects and household chores. When the utility data was segmented by the level of visual field loss, with severity of glaucoma (i.e., increased binocular visual field loss) there was an increased relative importance of 'central vision' whereas the relative importance of 'outdoor mobility' decreased. A similar change in attributes occurred when visual acuity values are decreased. In addition respondents with poorer central visual acuity placed more importance on darkness and glare.
B) levels of attributes designated 'none', 'a few' and 'a lot' of problems showed that the transition from 'a few' to 'a lot' of problems had greater impact on a persons quality of life.
C) A cluster analysis on the individual patient utilities showed two main and relatively independent subgroups of patients ' those whose priority was reading and those whose priority was outdoor mobility.
D) Only 17% of the cohort were willing to trade any time (months or years) for a return to normal vision. Those trading were found to have similar visual field profiles to the non traders. However they did have significantly poorer central visual acuity.
Conclusions: Quality of life assessments using time trade off and conjoint utilies in people with glaucoma showed little agreement mainly because 83% of patients refused to trade. Conjoint measures of importance showed reading and outdoor mobility had highest priority on quality of life. This was in agreement with a previous study by the authors using a different presentation of conjoint tasks. Increasing field loss increased priority of reading at the expense of outdoor mobility. Two subgroups of patient were identified with different priorities which has implications for rehabilitation strategies.

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1.5. General aspects: Glaucomas as cause of blindness

P025 PREVALENCE OF GLAUCOMA IN PAKISTAN- THE PAKISTAN NATIONAL BLINDNESS & VISUAL IMPAIRMENT SURVEY

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Purpose: To assess the prevalence of glaucoma and its contribution to visual impairment/blindness in Pakistan.
Design: Cross-sectional prevalence study.
Participants: The Pakistan national blindness and visual impairment survey involved a nationally representative sample of adults (n=16,507; 95% response rate) aged 30 years and older.
Methods: Each subject underwent: interview, visual acuity (logmar), autorefraction and undilated optic disc examination. 1:5 of consecutive subjects aged ≥40 years (a 'normative database', n=1868), those that saw <6/12 in either eye, and those with an undilated cup/disc ratio of ≥0.7 underwent a comprehensive examination that included corrected visual acuity, perimetry, Goldmann tonometry, dilated posterior segment examination. Glaucoma was diagnosed according to the International Society of Geographical and Epidemiological Ophthalmology Scheme.
Main outcome measures: Prevalence of glaucoma.
Results: Two hundred eleven subjects (102 women, 109 men) were identified with glaucoma, 54 (26%) of whom had been previously diagnosed, and 59 (27.9%) of whom saw <6/60 in the better eye. Glaucoma was present in 200 (2.9%) of those aged over 49 years. Glaucoma was the principal cause in 7.1% of blind adults (<3/60 in the better eye). An estimated 89,000 adults see <6/60 on account of glaucoma nationwide. Mean, 95%ile and 99% ILE values (using 'normative data') were 12 mmHg, 18 mmHg and 28 mmHg for intraocular pressure and 0.4, 0.7 and 0.9 for vertical cup/disc ratio.
Conclusions: This study is one of the largest and most comprehensive population-based studies worldwide. Glaucoma is an important cause of blindness and visual impairment in this population, with a relatively small proportion of cases previously diagnosed.
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P026 CHRONIC GLAUCOMA AS CAUSE OF BLINDNESS

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Purpose: 1. To know the definition, the physiopathology and the epidemiology of the chronic glaucome; 2. To enumerate the principal causes of glaucome chronic; 3. To know the elements of monitoring of the glaucome and their rate/rhythm; 4. To describe the principal medical and surgical treatments respective glaucome and their risks; 5. To be able to explain to the patient the forecast of the chronic glaucome.
Design: Patients, ophthalmologists, doctors, nurses, other persons.
Participants and/or controls: Société Française d'Ophtalmologie, Société Canadienne d'Ophtalmologie.
Methods: Glaucoma is a condition which affects the main nerve of the eye, the optic nerve. The optic nerve transmits the focused images from the eye to the brain. There are different types of chronic glaucoma, the most common is chronic open angle glaucoma.
Main outcome measures: In the common form high pressure within the eye over many months or years. This eventually causes irreversible damage to the nerve fibres within the optic nerve. This is considered to be due to disturbance to the blood supply to the optic nerve within the eye. It results in lack of oxygen (ischaemia) to the nerve which causes damage. In normal tension glaucoma there is an abnormality of the blood supply to the nerve and progressive damage may occur without high eye pressure. The end result is the same that unchecked progressive loss of the visual field results which may eventually lead to blindness.
Results: Treatment of chronic glaucoma is given only to prevent it from getting worse or at least to slow it down. The drops used may have side-effects. Pilocarpine makes the pupil small and vision goes rather dark. Adrenaline may make the eye red and sore. Beta-blockers can worsen asthma-type breathing difficulties. Carbonic Andydrase Inhibitors tablets may cause pins and needles in the hands and feelings of sickness and depression. Following operations, the eye is more susceptible to infections. You should notify the development of a red, sticky eye to your doctor immediately.
Conclusions: The monitoring regularly of the patient, at least every 6 months, examining the state of the optic nerve at the bottom of the IL, measuring the ocular pressure, and making practise an examination of the visual field of each. It is essential.

Reference:
Courses of Ophthalmology of second Cycle of the University of Rouen-France.

P027

1.6. General aspects: Prevention and screening

P028 THE RELATIONSHIP BETWEEN ADULT STATURE AND ANGLE DIMENSIONS. CAN ADULT STATURE BE USED AS A PREDICTOR FOR AN OCCLUDABLE ANGLE?

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Introduction: An estimated 33.5 million people have primary angle closure glaucoma (PACG) worldwide. A cost-effective screening programme to detect those at risk those most likely to develop an occludable angle, form the basis of public health initiatives to combat PACG. Our previous study demonstrated that adult height was independently related to ocular dimensions, namely taller people have longer globes and deeper anterior chambers. The aim of this study was to investigate whether adult height could be related to angle dimensions.
Methods: A population-based, cross-sectional survey of adult Chinese living in the Tanjor Pagar district in Singapore. The subjects were categorised into 6 different groups according to height in centimetres: <144, 145-149, 150-154, 155-159, 160-164, 165-169 and >170. Data collected included: ocular dimensions namely, anterior chamber depth, gonioscopy, intraocular pressure, refraction and socioeconomic information. Linear regression was used to assess for statistical significance.
Results: Complete data were available for 992 persons of which 450 were male and 546 were female. All pseudophakics, individuals with secondary or previously diagnosed glaucomas were excluded. The age range was 40 ' 81 years (mean 58.2 years). Anterior chamber depth increased with height from a mean of 2.35 mm for the <144 group to a mean of 2.72 mm for the >170 group. The mean gonioscopy score (using the shaffer grading system) increased with height: 2.2 for the <144 group to 3.0 for the >170 group. Mean intraocular pressure decreased with height from 15.8 mmHg for the <144 group to 14.0 mmHg for the >170 group. Adult height was found to be significantly related to anterior chamber depth (p=0.008) but not gonioscopic angle width, once age and sex were adjusted for (p=0.079). 86 individuals out of the whole sample were identified to have an occludable angle. In the group of individuals of height <160cm, age >50 years and of female sex, 57 of those 86 (66%) would have been identified. 36 individuals out of the whole sample were identified to have primary angle closure. In the group of individuals of height <160cm, age >50 years and of female sex, 20 of those 36 (56%) would have been identified.
Discussion: Adult height appears to be independently related to anterior chamber depth. The use of adult height with patient demographics might form part of a simple and rapid assessment to identify those at risk of an occludable angle for further monitoring.

P029 SCREENING FOR RISK FACTORS OF PRIMARY ANGLE CLOSURE SUSPECTS IN A RETIRED POPULATION OF THE COLOMBIAN ARMY

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Purpose: To evaluate a screening form as a potential tool to identify primary angle closure (PAC) risk factors in the colombian population.
Materials and Methods: A total of 131 volunteers with ages between 50 and 78 (mean 65,9) were evaluated. The screening form designed by us includes: height, intraocular pressure (IOP), gonioscopy (Spaeth grading system), pachymetry, anterior chamber depth (ACD), axial length, lens position and thickness, and indirect ophthalmoscopy. Angle closure classification was based in foster publication.
Different groups were classified as normal (n=90) primary angle closure suspects (pacs, n=19), and glaucoma suspects (n=22). Comparisons among the groups were performed using SPSS software.
Results: Mean height in PACS (14.5 %) was shorter than the comparison group. Despite the lower percentage of women in this population (30%) they were almost half of the cases of PACS (9 women and 10 men). Axial length (AL) and anterior chamber deep (ACD) were also shorter in these eyes. The position and thickness of the lens were also different between groups. The pachimetry shows a significant difference between groups. Twenty-two (16.8 %) of the subjects were considered glaucoma suspects base on IOP over 24 mmHg (n=5), excavations over 0.6 (n=13) and 1 case of unilateral pseudoexfoliation with IOP of 26 mmHg. The Spaeth gonioscopic grading system (as part of our evaluation instrument), was easy to apply. Nearly 70% of persons considered as primary angle closure (PACS) had been evaluated in the past two years by an ophthalmologist.
Conclusions: the screening form is a new and important tool to assess the importance of biometric and demographic risk factors for the detection of angle closure. Our population showed a high proportion of primary angle closure suspects. Women, small range of height and smaller eyes are easily identifiable and at a higher risk.
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P030 SCREENING FOR ANGLE CLOSURE IN THE SINGAPORE POPULATION: EVALUATION OF 3 NEW NON-CONTACT DEVICES

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Purpose: To assess the screening effectiveness of three new non-contact devices, the scanning peripheral anterior chamber depth analyzer (SPAC), which measures central and limbal anterior chamber depth (ACD); the IOL master, which measures central ACD and the visante anterior segment OCT (AS-OCT), which images the angles directly, and to compare these instruments with gonioscopy in identifying people with angle-closure.
Design: Cross-sectional, community-based study.
Participants: Phakic subjects aged 50 years and older without ophthalmic complaints were recruited from a community clinic in Singapore.
Methods: All subjects underwent examination with SPAC, IOL-master and AS-OCT in the dark by a single operator. Gonioscopy was performed by an ophthalmologist masked to the instruments' findings.
Main outcome measures: Eyes were classified as having angle closure if the posterior pigmented trabecular meshwork could be seen for less than 180° of the angle circumference by gonioscopy. The area under the receiver operating characteristic curve (AUC) was generated to assess the performance of these tests in detecting persons with angle closure in either eye.
Results: 2052 subjects were examined and underwent all 3 tests. The prevalence of angle closure in at least one eye diagnosed by gonioscopy was 20.4% (422 subjects). The AUC for SPAC using the numerical grade<5 as a cutoff was 0.83(95%CI:0.82-0.85), with a sensitivity of 90.0 %(95%CI:86.8-92.7) and a specificity of 76.6% (95%CI:74.4-78.6). AUC using the IOL-master at a cut-off ACD<2.87 mm was 0.83 (95%CI:0.81-0.85), with a sensitivity of 87.7% (95%CI:84.2-90.7), and a specificity of 77.7%(95%CI:75.6-79.7). The AUC using the AS-OCT was 0.76(95%CI:0.740.78), with a sensitivity of 88.4 (95% CI:84.991.3) and specificity of 62.9% (95% CI:60.5 '65.2).
Conclusion: New non-contact devices that rely on acd measurement such as SPAC and iolmaster have the potential to be used in screening for angle closure.
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P031 SCREENING EYES AT RISK OF ANGLE CLOSURE GLAUCOMA IN PUBLIC HEALTH EXAMINATION

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Purpose: We started a screening program named angle-closure study in Tamaho Yamanashi Japan since 2004 in which eyes at risk of angle-closure glaucoma had been screened using scanning peripheral anterior chamber depth analyzer (SPAC) in a public health examination. This program successfully screened many unfound eyes with primary angle closure glaucoma (ACG) or at risk of angle closure glaucoma every year. In this report, we present the results of this program in 2006.
Materials and Methods: A total of 512 (123 males and 389 females) local residents 40 years old or over were enrolled in this year. In primary screening, non-physicians measured anterior chamber depth (ACD) using SPAC and enrolled subjects were classified into four groups based on SPAC judgment as previously reported: group 1: having deep ACD and no risk of ACG; group 2: having moderately deep ACD but low risk of ACG; group 3: having narrow ACD and risk of ACG; and group 4: no available ACD data. All the subjects from group 3 and those from group 2 or group 4 were subjected to definitive examination.
Results: Fifty-nine (11.5%) subjects were recruited to the definitive examination. The final diagnoses were four subject with primary ACG, 6 subjects with primary angle closure (PAC), and 20 PAC-suspect subjects. All of them were from group 3 and 36 subjects (90.0%) were newly diagnosed.
Conclusion: SPAC successfully found out many latent eyes at risk of ACG as previous years.
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2. ANATOMICAL STRUCTURES IN GLAUCOMA

2.2. Anatomical structures in glaucoma: Cornea

P032 CENTRAL CORNEAL THICKNESS IN PATIENTS WITH ADVANCED PRIMARY OPEN ANGLE GLAUCOMA

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Purpose: To compare central corneal thickness (CCT) in pa-

tients with advanced primary open angle glaucoma (POAG) and healthy persons in the same age group.
Methods: A total of 40 patients (mean age 66,7) with uncontrolled advanced POAG, diagnosed by the following methods: biomicroscopy, gonioscopy, ophtalmoscopy (cup/disc ratio>6pd), standard automatic perimetry (md>-6), underwent measuring of CCT. The results of CCT were compared to those of 30 healthy persons of the same age group. Additionaly comparative analysis of patients with POAG, divided in two groups according to CCT, was performed.
Results: Results have been analyzed, discussed and compared to those of other autors. CCT was statistically thinner in patients with advanced POAG. Patients with thinner corneas <520 revealed worse glaucoma defects.
Conclusion: Patients with advanced POAG had statistically thinner CCT. CCT is of diagnostic value in patients with POAG.
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P033 CENTRAL CORNEAL THICKNESS IN NORMAL SUBJECTS AND PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA
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Purpose: To compare the central corneal thickness (CCT) measurements of normal eyes and eyes with primary open-angle glaucoma.
Design: Non-randomized clinical trial.
Participants: Forty-six control persons (91 eyes) (mean age was 37,8±14,5) and 56 patients (100 eyes) with primary open-angle glaucoma (mean age of the patients was 60,2±11,8) were examined. Patients who had undergone filtering surgery were not included in this study.
Methods: For all patients CCT and Goldmann intraocular pressure (IOPG) were measured by Reichert's ocular response analyzer (ORA).
Main outcome measures: Goldmann intraocular pressure (mmHg) and central corneal thickness (μm) were estimated.
Results: The mean (±SD) IOPG in control group and patients with glaucoma were 16,8±3,2 mmHg and 23,3±7,6 mmHg, respectively. There was no significant difference between the mean CCT in two groups (554,4±28,1 μm in normal subjects and 557,9±31,5 μm in patients with glaucoma). In both groups «thin» corneas (<520 μm) composed 15%, «normal» (520-570 μm) and «thick» corneas (>570 μm) 50% and 40%, respectively. There was no correlation between CCT and age in normal population. The mean CCT values in normal subjects and patients with glaucoma after age of 45 were lower in compare to patients of age younger than 45 (p=0,06 and p=0,05). In glaucomatous population there was a negative correlation between CCT and age (r=-0,295, p=0,002). The CCT/IOPG relationship was manifested in normal (r=0,26, p=0,01) and glaucomatous (r=0,25, p=0,01) populations.
Conclusion: CCT may be used for correction of individual IOP readings. In normal population there is only a tendency of CCT to decrease with increasing of the age, where as in patients with primary open-angle glaucoma this parameter significantly reduces with age.
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P034 CENTRAL CORNEAL THICKNESS IN DIFFERENT TYPES OF GLAUCOMA, OCULAR HYPERTENSION AND NORMALS
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Purpose: To evaluate the central corneal thickness (CCT) in patients with primary open angle glaucoma (POAG), pseudoexfoliative glaucoma (PXG), normal tension glaucoma (NTG), suspect glaucoma, ocular hypertension (OH) and normal subjects.
Methods: Seven hundred and forty eyes of 372 patients were enrolled. The six groups represented in the study were POAG (n=90; 178 eyes), PXG (n=36; 72 eyes), NTG (n=69; 137 eyes), suspect glaucoma (n=50; 100 eyes), OH (n=46; 92 eyes), normals (n=81; 162 eyes). CCT was measured by means of ultrasound pachymetry (pach iv, accutome) and analyzed using anova. Correlation of mean CCT with age, gender, glaucoma stage and intraocular pressure (IOP) was estimated.
Results: The mean CCT of all eyes was 549±36 microns (range 430-692 μ). CCT of eyes with POAG (554±28 μ), PXG (544±45 μ), suspect glaucoma (555±26 μ) and nor-

mal eyes (549±36 μ) did not significantly differ. The CCT of eyes with NTG (519±23 μ) was significantly less than that of the other groups (p<0.001). The eyes with ocular hypertension had corneas significantly thicker than those of the other groups (578±37 μ; p<0.001). A significant negative correlations was detected between CCT and stage of disease in all glaucomatous patients (r = 0.191; p<0.001) and especially in patients with POAG (r = 0.278, p<0.001). Among patients with POAG, PXG, NTG decreasing values of CCT were significantly related to older age (r = 0.180, p= 0.012). There was possitive relationship between CCT and IOP in normal subjects (r = 0.206; p=0.008).
Conclusions: 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.
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P035 INFLUENCE OF PERSISTENT EYE-OPENING ON CENTRAL CORNEAL THICKNESS MEASUREMENT
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Purpose: The influence of central corneal thickness (CCT) on intraocular pressure measurement has recently been attracting attention; however, CCT measurements fluctuate considerably, depending on various factors. To clarify those factors, including corneal dehydration, we investigated the influence of persistent eye-opening on CCT measurement.
Subjects and Methods: Enrolled in this study were 11 normal volunteers with written informed consent (5 females, 6 males, mean age: 32.0 ± 6.8 years). CCT was measured using a Pentacam (oculus). First, the influence of ocular surface anesthesia on CCT measurement was investigated in the volunteers' right eyes, as compared to the CCT value before and after the instillation of anesthetic eyedrops (oxybuprocaine hydrochloride). Subsequently, baseline CCT was measured twice under the condition of natural blinking. After ocular surface anesthesia, subjects were told to keep the left eye open for 5 minutes and then commence blinking naturally for 10 minutes. During those 15 minutes, CCT was measured once per minute. For statistical analysis, paired t test was used.
Results: No significant difference was noted between CCT measurements taken before and after instillation of ocular surface anesthesia. Baseline CCT (584.2±45.4 μm) began decreasing significantly right after eye opening, and kept decreasing gradually for 5 minutes. During the recovery phase, CCT just after blinking increased significantly (561.6±35.1 μm), as compared to CCT at 5 minutes (554.5±36.7 μm), whereas final CCT at 15 minutes had not recovered to the original baseline level (561.6±30.8 μm).
Conclusion: CCT decreased significantly under the condition of persistent eye-opening because of corneal dehydration, which could lead to fluctuation in CCT measurement.
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P036 INTRAOCULAR PRESSURE, CORNEAL THICKNESS AND CORNEAL HYSTERESIS IN STEINERTS MYOTONIC DYSTROPHY
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Purpose: Low intraocular pressure (IOP) is one of the ocular manifestations of Steirnert's myotonic dystrophy (SMD). The goal of this study was to evaluate Goldmann and corneal-compensated IOP, corneal central thickness (CCT), and corneal hysteresis in patients with SMD.
Design: Prospective, cross-sectional, case-control study.
Participants and controls: A total of 12 eyes of 6 patients with SMD were included in the study group. A total of 12 eyes of 6 age-, race-, and gender-matched healthy volunteers were included in the control group.
Methods: All subjects underwent a complete ophtalmologic evaluation and patients presenting any significant ocular disease were excluded. IOP was measured using Goldmann applanation tonometer (GAT), dynamic contour tonometer (DCT) and ocular response analyzer (ORA) in a random order. CCT was obtained by ultrasound pachymetry. The corneal hysteresis was obtained by ORA. Three measurements of each device were taken and the mean measurements were used for the analysis. In light of the multiplicity of tests performed, the significance level was set at 0.01 rather than 0.05.
Main outcome measures: Corneal hysteresis and intraocular pressure.
Results: The mean (standard deviation [SD]) IOP provided by GAT, DCT, and corneal-compensated ORA in the study group was 5.4 (1.4) mmHg, 9.7 (1.5) mmHg, and 10.1 (2.6) mmHg, respectively. The mean (SD) IOP provided by GAT, DCT, and corneal-compensated ORA in the control group was 12.6 (2.9) mmHg, 15.5 (2.7) mmHg, and 15.8 (3.4) mmHg, respectively. The differences in IOP between the study and control groups were statistically significant in the GAT (mean,7.2 mmHg; 99% confidence interval [CI],10.5 to3.9 mmHg; p<0.001), DCT (mean,5.9 mmHg; 99% CI,8.9 to2.8 mmHg; p<0.001), and corneal-compensated ora IOP (mean,5.7 mmHg; 99% CI,10.4 to1.0 mmHg; p=0.003). The mean (SD) CCT in the study and control groups were, respectively, 542 (31) μm and 537 (11) μm (p=0.65). The mean (SD) corneal hysteresis in the study and control groups were, respectively, 11.2 (1.5) mmHg and 9.7 (1.2) mmHg (p=0.04).

Conclusions: The patients with SMD showed lower Goldmann and corneal-compensated IOP in comparison with healthy individuals. The CCT and corneal hysteresis in this dystrophy were within the normal range. These facts imply that the low IOP readings found in SMD are not related to changes in corneal biomechanical properties.

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P037 LOWER CORNEAL HYSTERESIS IN GLAUCOMA PATIENTS WITH ACQUIRED PIT OF THE OPTIC NERVE

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Objective: Acquired pit-like changes of the optic nerve head (APON) are more commonly seen in patients with normal tension glaucoma and may be a sign of a localized susceptibility of the optic nerve. Thus, it is possible that biomechanical properties of the ocular tissues may play a pressure-independent role in the pathogenesis of glaucoma. Corneal hysteresis (CH) could provide information of the biomechanical properties of the ocular hull tissues and it has been shown that low CH is associated with progressive visual field loss in glaucoma. The purpose of this study was to compare the biomechanical properties of patients with primary open angle glaucoma (POAG) with and without APON.
Design: Prospective case control study.
Participants: POAG patients with and without APON.
Methods: Consecutive POAG patients with and without APON were recruited from October 2006 to February 2007. Corneal hysteresis was measured with the ocular response analyzer (Reichert). The observer was masked to the optic disc findings. Patients in both groups were matched for sex, age, corneal thickness and maximal IOP. Patients with previous intraocular surgery, corneal disease, connective tissue disorders or refractive error more than ± 4 d were excluded. One eye per patient was analysed. If both eyes were eligible, the right eye was included for analysis. Statistical analysis was done using the unpaired t-test.
Main outcome measures: Corneal hysteresis.
Results: Corneal hysteresis of 13 eyes with apon and 26 controls were measured. The mean (± SD) CH in the APON-group was 8.58 (± 1.19) and 10.3 (± 1.12) in the control group. The difference was statistically significant ($p<0.01$).
Conclusions: Corneal hysteresis in POAG patients with APON was significantly lower than in patients that did not have such structural changes of the optic disc. These findings may reflect pressure-independent mechanisms involved in the pathogenesis of glaucomatous optic nerve changes.

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P038 CENTRAL CORNEAL THICKNESS AND PRIMARY ANGLE OPEN GLAUCOMATOUS NEUROPATHY

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Objective: To observe central corneal thickness, optic disc morphology in primary angle open glaucoma, and to investigate the association of central corneal thickness with POAG neuropathy.
Design: Clinical cross-sectional study.
Participants: Two hundred eighteen eyes of 115 POAG patients were included 74 patients (145 eyes) from glaucomatous clinics in the Beijing Tongren hospital and 41 patients (73 eyes) from the population of Beijing Eye Study in 2006.
Methods: POAG patients underwent visual acuity, intraocular pressure, colored fundus photos, FDP or octopus perimeter and central corneal thicknesses by a slit-lamp adapt OCT. Gender, age, medical and family history, diabetes mellitus and systemic hypertension history were recorded. From colored fundus photos, the glaucomatous neuropathy was graded on Jonas' principle and optic disc parameters were examined on Littmann's method.
Main outcome measures: Central corneal thickness, glaucomatous neuropathy grades, optic disc morphology.
Results: Mean central corneal thickness was 533.5 um (SD, 29.9 um) in all eyes of POAG patients. The central corneal thicknesses in patients with last three glaucomatous neuropathy grades were significant thinner than those with first two grades ($p<0.01$).cup area, cup-disc area ratio, vertical cup diameter, vertical cup-disc ratio, horizontal cup diameter, horizontal cup-disc ratio was positive correlative with glaucomatous neuropathy grade ($p<0.001$), and rim area, rim-disc area ratio was negative correlative with glaucomatous neuropathy grade ($p<0.001$). In relative severer eyes of 58 patients whose two eyes had different glaucomatous grades, central corneal thickness was significant less than that in follow milder eyes(531.9 um vs 536.5 um , $p<0.05$). Central corneal thickness was negative correlative with vertical cup-disc ratio ($p<0.001$), horizontal cup-disc ratio ($p<0.001$), cup area ($p<0.05$), cup-disc area ratio ($p<0.001$), glaucomatous neuropathy grades ($p<0.001$), and positive correlative with rim area ($p<0.001$), rim-disc area ratio($p<0.001$) in single and multiple regression analysis.

Conclusions: The association with central cornea thickness and optic disc morphology shows that central corneal thickness may take a role in pathogenesis of POAG and supply a useful index in clinical diagnosis.

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P039 EFFECT OF CENTRAL CORNEAL THICKNESS IN PSEUDOEXFOLIATION PATIENTS WITH AND WITHOUT GLAUCOMA

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Purpose: Central corneal thickness (CCT) influences measured intra ocular pressure (IOP); with thinner central cornea, IOP will be underestimated. Thinner CCT represents a significant risk factor for glaucoma. It is a well-published fact that pseudoexfoliation (PXF) is an important factor for development of secondary open angle glaucoma. In PXF eyes, regardless of the presence of glaucoma in the patients, the corneal endothelial cell density is decreased and the central cornea is thin. To evaluate CCT in eyes having PXF with and without glaucoma and compare it with normal subjects without glaucoma.

Design: Prospective, non-randomized clinical trial.

Participants and controls: The study included 25 eyes of pxf with glaucoma, 66 eyes of PXF without glaucoma and 33 eyes of normal subjects without glaucoma (control group).

Methods: CCT was measured using ultrasonic pachymetry. IOP was measured using applanation tonometry. Humphrey field analysis and optical coherence tomography were done in patients to either confirm or rule out the diagnosis of glaucoma.

Main outcome measures: Central corneal thickness.

Results: In our study the mean age of patients was 64.27 years (ranged 32-84 years). Of all patients 66.9% were females and 33.1% were males. CCT measured were group A 535.1 ± 49.2µm, group B 545.4 ± 39.6 µm. Group C 550.1 ± 34.2 µm. No statistically significant difference obtained in CCT values when compared between these three groups.

Conclusions: Our study shows that CCT was thinner in eyes with PXF and more so in eyes with PXF with glaucoma as compared to normal subjects.

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P040 IS MEASUREMENT OF CENTRAL CORNEAL THICKNESS ONCE SUFFICIENT?

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Objective and Purpose: Central corneal thickness (CCT) is a valuable parameter for risk analysis, follow-up and planning treatment of glaucoma. The aim of this study is to seArch if measurement of CCT only once is sufficient for the purposes of glaucoma clinics.

Design: CCT of 134 eyes of 68 ocular hypertension or glaucoma patients was measured on two different visits using an ultrasonic pachymeter. On each visit, CCT measurements were repeated at least 5 times and averaged. Patients with prior incisional surgery or corneal diseases were excluded. Patients were allowed to use antiglaucomatous medications during the study. Seventy eight patients were not using any medications.

Results: Average patient age was 58 (35-79), and the interval between two measurement periods was 13 months (1-32 months). The mean CCT values were significantly different between the two visits (562±35 µm and 558±35 µm, p=0.01). There was a measurement difference of 10µm and above in 58 (%42) eyes between the two measurements, 20µm or more in 16 (%11) eyes and 30µm or more in 3 eyes (%2). A significant difference between two mesauerements were found in patients using prostoglandin analogues when relationship between CCT difference and the type of medication used were analysed (p=0.021). No significant differences between two CCT measurements were found in eyes on other medications and without any medications (p=0.8). Conclusions in this study CCT measurements differed by at least 20 in 11% of patients on two different visits which is capable of affecting risk analysis, follow-up and treatment in glaucoma practice. This can stem from different measurement technqiues between users, use of prostaglandin analogues or spesific variables related with the patient. This study points that one measurement of CCT should not be considered sufficient in glaucoma clinics and that it would be wiser to consider CCT after at least two consistent measurements on different visits.

P041 DIABETES, HYPERGLYCEMIA AND CENTRAL CORNEAL THICKNESS: THE SINGAPORE MALAY EYE STUDY (SIMES)

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Purpose: To examine the relationship of diabetes and hyperglycemia with central cornea thickness (CCT) in Malay adults in Singapore.
Design: Population-based cross-sectional study.
Participants: 3280 Malay adults aged 40 - 80 years living in Singapore.
Methods: The population was selected based on an age-stratified random sampling procedure of Malay people living in the south-western part of Singapore. Participants had a standardized interview, examination and ocular imaging at a centralized study clinic. CCT measurements were performed with an ultrasound pachymeter. Non fasting serum glucose and glycosylated haemoglobin (HBA1c) was measured from all participants. Diabetes was defined as defined as non-fasting glucose levels of ≥200 mg/dl [11.1 mmol/l], or self report of diabetic medications use or physician diagnosis of diabetes.
Main outcome measures: CCT, non-fasting serum glucose and HBA1c.
Results: CCT was recorded for 3240 right eyes. In this population, CCT was normally distributed with a mean of 541.2 um. There were 748 persons with diabetes (23.0%). After controlling for age and gender, persons with diabetes had a significantly greater CCT (547.2 um) than persons without diabetes (539.3 um, p<0.001), and CCT was greater with higher serum glucose levels (539.6, 540.2, 541.3, 544.4, comparing increasing glucose quartiles, p=0.023) and higher HBA1c levels (537.8, 541.0, 541.4, 545.5, comparing increasing HBA1c quartiles, p<0.001). In multiple linear regression models adjusting for age, body mass index, intraocular pressure and axial length, persons with diabetes had, on average, CCT 6.50 um greater than persons without diabetes.
Conclusions: This population-based study has shown that diabetes and hyperglycemia are associated with greater CCT, independent of age and intraocular pressure levels.
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P042 IOP AND PACHYMETRY IN COLOMBIAN OAG VS OAG SUSPECTS

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Objective: To describe IOP and pachymetry in two groups of colombian patients with OAG (before treatment) and OAG suspects. To evaluate if risk calculators derived from the OHTs are applicable to the OAG suspects group.
Design: Retrospective cohort study.
Materials and Methods: Only Colombian patients with newly confirmed OAG diagnosis and OAG suspects were included. All patients had ultrasound corneal pachymetry. Patients with previous medical or surgical treatment for any type of glaucoma and those having only one IOP measurement were excluded. All patients had a comprehensive adult eye examination (AAO). IOP was measured with Goldmann applanation tonometry. Angle aperture was evaluated with indirect gonioscopy. Visual field testing humphrey SITA-standard 24-2. ONH documentation with photos, HRT or OCT. Some patients had serial tonometry and/or water drinking test tonometry. Results were kept in an electronic data base for future analysis
Results: Fifty-one OAGg suspects, median age 52, showed a normal distribution in corneal pachymetry, and average IOP of 15.7 (sd 12.2-19.2). Sixty-three OAG patients, median age showed a normal distribution for their corneal pachymetry and average IOP of 16.6 (SD 12.1- 21-1).
Conclusion: In this group of Colombian patients, the corneal pachymetry distribution was normal. Seventy-eight percent of OAG had IOP below 24 mmHg; the average IOP in both groups was low and only 6 OAG suspects could be considered ocular hypertensives according to the OHTs criteria. Therefore, only 6 patients could be evaluated with star (scoring tool for assessing risk). IOP values in OAG an OAG suspects Colombian patients correlate with IOP in other OAG latino populations (Lales) and may be comparable to IOP values obtained in other OAG population based studies (Tajimi).

P043 IMPORTANCE OF CENTRAL CORNEAL THICKNESS MEASUREMENT IN GLAUCOMA CLINICS

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Introduction: Glaucoma, a leading cause of blindness in the UK, is characterized by damage to the optic nerve head, usually although not always, due to raised intra ocular pressure (IOP) and in advanced stages visual loss is caused by progressive loss of visual field. Early diagnosis and prompt treatment are key to glaucoma management. The main aim of treatment is to lower IOP to preserve visual function. Target IOP is set for each individual patient depending on patient's age, IOP at diagnosis and severity of disease. The European Glaucoma Society produced a set of guidelines in 2003 to help practitioners when examining glaucoma patients. They recommended that CCT was carried out on all new glaucoma patients as standard, together with four other criteria, i.e., IOP measurement, gonioscopy, optic disc assessment and visual field analysis, to aid in diagnosis making. Average values for CCT are 500-550 microns (μ). Typically, a CCT-reading of less than 500 μ is classified as a 'thinner cornea' and

more than 600 µ as a 'thicker cornea'. Practitioners need to be mindful of corneal thickness and IOP relationship; IOP readings with Goldmann tonometery are falsely high with thicker corneas and vice versa.
Aims and Objectives: 1. To evaluate the role of pachymetry in diagnosis of glaucoma. 2. To establish if one CCT measurement was enough.
Methodology: A retrospective analysis of existing glaucoma patients at Clayton and Dewsbury hospitals between April 2002 and September 2006. Data was collected on a proforma and analyzed using microsoft excel programme.
Results: One hundred sixty-eight patients identified. Average CCT was 538.6µ and corneas were relatively thicker in OHT patients and thinner in NTG patients. All eyes were further analyzed by dividing them into groups depending on their diagnosis, and IOP measurements were found to be higher in eyes with thicker corneas. 49 eyes of 35 patients had 2 CCT readings taken over a period of time but no clinically significant difference in CCT measurement was found on different occasions.
Conclusions: CCT affects IOP, and therefore should be routinely carried out on all glaucoma patients. CCT measurement helps in setting an accurate target IOP range and prevents over treatment.

P044 TROPICAMIDE DOES NOT ALTER CENTRAL CORNEAL THICKNESS.

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Purpose: To evaluate whether g. Tropicamide 1% (Minims, Chauvin Pharmaceuticals Ltd) affects central corneal thickness (CCT) and intraocular pressure measurement (IOP) by Goldmann applanation tonometry.
Design: Patients had three measurements in the mid-pupillary axis both pre- and 15 minutes post instillation of g. Tropicamide 1%. One eye was included per patient. IOP was also measured pre and post g. Tropicamide 1% instillation.
Participants: Fifty-two Caucasians. No controls were used.
Main outcome measures: CCT and IOP were measured pre and post g. Tropicamide 1% instillation.
Results: The mean CCT (± 2 SD) pre-tropicamide instillation was 553.7 µm (± 54.8). The mean CCT post-tropicamide instillation was 554.7 µm (± 56.14). This was not a statistically significant difference (t-test: paired two sample for mean). The median CCT remained unchanged at 550.5 µm pre-and post-tropicamide instillation. The maximum IOP rise post-tropicamide instillation was 2 mmHg.
Conclusions: Any measured change in IOP after pupil dilation with g. Tropicamide 1% is not due to a change in CCT.
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P045 CORNEAL ENDOTHELIAL CELL DENSITY IN OPEN ANGLE GLAUCOMA

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Purpose: To measure the cell density of the corneal endothelium in glaucomatous eyes (a) at diagnosis and (b) after longterm medical therapy.
Methods: A first cohort of 126 consecutive eyes, scheduled for cataract surgery and urrently treated with multidose topical hypotensive drugs, were selected for the study and matched by age with control eyes. A second cohort of 56 untreated newly diagnosed glaucomatous eyes was matched by age with 56 control eyes referring to the outpatient clinic for near refraction assessment. Exclusion cfrieria: previous bulbar surgery or laser, diabetes, history of keratitis, chronic artificial tears, bulbar trauma, uveitis, narrow angle, PEX endothelial cell count was performed with a non-contact Topcon sp 2000 p endothelial specular microscope. Eyes were divided into the following categories: (a) < 1000 cells, (b) 1000-1500, (c) 1500-2000, (d) 2000-2500, (e) > 2500 cells.
Results: The data from the treated patients are summarized in the following table

Cell count	< 1000	1000-1500	1500-2000	2000-2500	> 2500
Controls	4	12	82	20	8
Glaucoma	28	71	18	5	2

(chi square = 113, p < 0.00001). The cell density was inversely related to the duration of treatment (Spearman rank regression analysis, p < 0.001). No correlation was detected between cell density and (a) number of scheduled eyedrops / day (Spearman rank regression analysis, p = 0.345) and (b) mean IOP of the daily phasing during treatment (Spearman rank regression analysis, p = 0.127) the data from the untreated patients are as follows:

Cell count	< 1000	1000 1500	1500 2000	2000 2500	> 2500
Controls	3	6	24	22	1
Glaucoma	6	9	23	18	0

(chi square test, p = 0.179) the cell density moderately correlated with the mean IOP of the daily phasing (Spearman rank regression analysis, p = 0.045).
Conclusions: Corneal endothelial cell density is lower in open angle glaucomatous eyes undergoing longterm multidose medical treatment.

P046 CENTRAL CORNEAL THICKNESS (CCT) IN DANISH OCULAR HYPERTENSIVE AND GLAUCOMA PATIENTS

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Purpose: Glaucoma is a progressive optic neuropathy in which the intraocular pressure (IOP) is the most important risk factor for progression of the disease. According to the Ocular Hypertension Treatment Study, important risk factors for progression of ocular hypertension into glaucoma also includes CCT and cup-disk ratio. IOP measurement may cause readings that is depending on CCT. The scope of this study was to investigate the correlation between the CCT and previously identified rate of progression of the disease in a group of Danish patients suffering from ocular hypertension (OH) and glaucoma.
Design: A cross sectional measurement of CCT and other indicators for severness of OH and glaucoma. Sonomed pachymeter 300 AP were used for CCT measurement.
Participants: Ophthalmologists in private practice with up to 60 OH and glaucoma patients.
Outcome measures:All participating ophthalmologists were instructed in the use and calibration of the pachymeter. They were furthermore encouraged to use the pachymeter for at least one week prior to the start of the consecutive screening of the CCT on patients, attending the practice in a given period. Before measuring the CCT, the ophthalmologists were asked to evaluate the rate of progression of the disease on a visual analogue scale (VAS).
Results: 3150 patients entered. Seventy-four patients were excluded mainly because of missing data for age, gender or diagnosis. Mean CCT for a Danish OH and glaucoma patients was recorded 560.5 my meters (SD 41.3) The correlation between CCT and the recorded rate of progression of the disease was found to be negatively correlated: $p<0.0001$ $R= -0.25$ (Fig 1).
Conclusion: The CCT is negatively correlated to the clinical estimation of the rate of progression of glaucoma in a large Danish glaucoma patient population. CCT measurement may be a valuable additive diagnostic tool when estimating the rate of progression in glaucoma patients.
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2.3. Anatomical structures in glaucoma: Sclera

P047 MECHANICS OF INDIVIDUAL-SPECIFIC MODELS OF THE CORNEO-SCLERAL SHELL IN GLAUCOMA.

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Purpose: Previous work suggests that IOP-induced forces acting on the optic nerve head (ONH) depend strongly on scleral thickness and globe diameter, among other factors (IOVA, 46:4189). Here we study the biomechanics of whole human globes, with emphasis on force transmission to the ONH.
Methods: Individual-specific finite element computer models of the corneo-scleral shell and lamina cribrosa (LC) were reconstructed from μMRI scans of 3 enucleated, ostensibly normal, human post mortem eyes, as described elsewhere. Simplified axisymmetric models with homogeneous thickness based on the mean thickness and curvature of each scleral shell were also created. Commercial software (Ansys Inc, USA) was used to predict ocular response to an IOP increase from 5 to 50 mmHg in all models. Tissue properties were as previously described (IOVA, 46:4189). Median and peak (95th percentile) magnitudes of IOP-induced equivalent stress and principal strains were used to quantify the biomechanical response.
Results: In individual-specific models, global mean stresses were 10.5, 8.2 and 10.4 times the IOP (XIOP). There were substantial variations in stress and strain from one region to another, with peak stresses of (XIOP): 18.7, 14.1 and 17.4. Longitudinally, stresses and strains were maximal at the equator, and up to 2x those at the poles. Stresses also varied circumferentially and were as much as 40% higher on one side than the other at the equator. In the peripapillary region the stresses were relatively axisymmetric in some eyes (5% variation) and asymmetric in others (30% variation). Stresses and strains were more homogeneous in the simplified models, e.g., in the simplified model of eye 1 global mean and peak stress were (XIOP) 10.8 and 11.4.
Conclusions: Physiologically accurate models of human globes confirm that scleral geometry has a substantial influence on ocular biomechanics. The magnitude and axial symmetry of the forces exerted on the onh by the sclera vary between individuals, and could potentially influence onh sensitivity to IOP.

P048 MEASUREMENT OF SCLERAL THICKNESS DISTRIBUTION IN HUMAN EYES USING MICRO-MRI

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Purpose: Previous studies (IOVS, 2005, 46:4189) suggest that scleral thickness has a substantial influence on the biomechanics of the optic nerve head (ONH), which is believed to play a role in the pathogenesis of glaucomatous optic neuropathy. Here we measure the three-dimensional (3-d) scleral thickness distribution of whole human eyes.
Methods: Enucleated ostensibly normal human post mortem eyes (n=3) were fixed and bathed for at least two weeks in 2 mm gadoteridol (Prohance, Bracco Diagnostics), a t1 shortening agent. Micro-mri was performed using a 7t scanner (Varian Instruments, Palo Alto, CA) and a t1-weighted spin-echo 3-d protocol that gave 80 µm isotropic resolution over the entire eye. Scans were manually segmented, simplified and smoothed using amira 3.1.1 software (Mercury Computer Systems, inc.). Scleral thickness was measured at every surface node (~800,000 points) of the resulting 3d models. The sclera was divided by 6 parallels and 8 meridians, forming 56 regions. Global and regional mean scleral thicknesses were computed.
Results: Global scleral thicknesses of the 3 eyes were (mean ± SD): 543.76±229.29 µm, 687.29±246.61µm, and 576.85±193.38 µm. The ratios of largest over smallest mean regional thicknesses within an eye were: 4.38, 3.74, and 3.21, respectively. Mean regional scleral thickness ranged from 218.46 µm at the equatorial inferior temporal region of eye 1 to 1069.41 µm at the peripapillary nasal superior region of eye 2. Thickness distribution was not axisymmetric, e.g., eye 2 was more than three times thicker at the equator in the inferior temporal region (913 µm) than in the superior nasal region (286 µm).
Conclusion: Micro-MRI has been shown to provide detailed maps of scleral thickness while overcoming many of the artifacts of previous techniques. There were substantial variations in regional scleral thickness between eyes, but also within an eye. The effects of these variations in onh biomechanics are still unclear and should be further investigated.

2.4. Anatomical structures in glaucoma: Anterior chamber angle

P049 A COMPARISON OF IRIS THICKNESS BETWEEN GLAUCOMA PATIENTS AND NORMAL EYES IN THAILAND

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Purpose: To compare the iris thickness between glaucoma patients and normal subjects using ultrasound biomicroscopy (UBM).
Design: A prospective comparative clinical trial.
Participants: This study included 125 eyes from 125 subjects who were categorized as having primary angle closure glaucoma (PACG) 36 eyes, primary open angle glaucoma (POAG) 46 eyes, and normal subjects 43 eyes. All eyes with PACG underwent laser peripheral iridotomy (LPI) at the superior quadrant at least 3 months prior to the study.
Methods: The inferior anterior chamber angle was measured by using UBM. Only one eye from each subject was randomly selected for the study.
Main outcome: The obtained data included iris thickness (ID), anterior chamber depth (ACD), angle opening distance (AOD), trabecular-ciliary process distance (TCPD), iris-ciliary process distance (ICPD), scleral ciliary process angle (SCPA) and scleral iris angle (SIA). The comparison between the groups was analyzed by using one-way anova and t-test.
Results: The peripheral iris thickness (ID1) in PACG was not significantly different from POAG and normal subjects (0.46+0.06, 0.46+0.06 and 0.47+0.09 mm, p=0.52, 0.12, respectively). The iris thickness 2 mm from the iris root (ID2) in PACG (0.52+0.07 mm) was significantly thinner than for normal subjects (0.56+0.09 mm) but not for POAG (0.52+0.11 mm). The maximal iris thickness near the pupillary edge (ID3) in PACG (0.59+0.10 mm) was significantly thinner than for POAG and normal eyes (0.64+0.11 and 0.67+0.08 respectively, p<0.001). PACG had ICPD less than POAG and SCPA, SIA less than for normal subjects. Both POAG and normal subjects had ACD, AOD, and TCPD significantly greater than PACG.
Conclusion: The UBM finding of peripheral iris thickness (ID1) in PACG after LPI was not significantly different from POAG and normal subjects. PACG has shown a thinner iris thickness (ID2 and ID3) when compared to normal eyes.
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2.5.1. Anatomical structures in glaucoma: Meshwork: Trabecular meshwork

P050 EFFECT OF DEXAMETHASONE ON THE EXPRESSION OF ZO-1 IN GLAUCOMATOUS TRABECULAR MESHWORK CELLS

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Purpose: Dexamethasone (DEX) may contribute to enhanced glucocorticoid responsiveness and increased IOP in patients with primary open-angle glaucoma (POAG), and intercellular junctions are likely involved in the mechanism of increased resistance associated with glucocorticoid exposure. The present study aims to investigate the effect of DEX on the expression of the junction-associated protein zonula occludens protein-1 (ZO-1) in glaucomatous trabecular meshwork (GTM) cells.
Methods: The GTM cells were derived from trabeculectomy of patients with POAG. Third-passage cells were identified, and then separately plated on plastic dishes or transwell

plates. After 1d, 3d, 5d of 0.1mm DEX treatment, western blot analysis and immunocytochemistry analysis were performed to detect the expression of ZO-1 in GTM cells from the same patient with or without DEX treatment. Transepithelial electrical resistance (TEER) across monolayer of GTM cells was measured by an evom voltohmmeter.
Results: After 1d, 3d, 5d of 0.1mm DEX treatment, the expression of ZO-1 was increased by 5- , 2- ,1-fold, and TEER was increased by 33%, 88%, 95%, compared with that in the GTM cells without DEX treatment. Immunocytochemistry analysis showed that the distribution of ZO-1 did not change significantly, but the expression of ZO-1 in the membrane proximal cytoplasm markedly increased in the GTM cells with DEX treatment.
Conclusions: These results indicate that the junction-associated protein ZO-1 is associated with the development and maintenance of transendothelial flow resistance in cultured GTM cells. It suggests that ZO-1 may play a role in glucocorticoid hyperresponsiveness in POAG.
This work was supported by grants from the foundation for the author of national excellent doctoral dissertation of China no. 200363.
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P051 IMMUNOHISTOCHEMICAL EVALUATION OF THE EXTRACELLULAR MATRIX IN TRABECULAR MESHWORK IN STEROID-INDUCED GLAUCOMA

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Purpose: To immunohistochemically examine the localization of the extracellular matrix (ECM) in the trabecular meshwork (TM) in steroid-induced glaucoma (SG) specimens.
Design: Retrospective case-control study.
Participants: Two patients with SG and 2 with primary open angle glaucoma (POAG).
Methods: We morphologically and immunohistochemically examined 3 trabeculectomy specimens obtained from 2 patients with SG and 2 from 2 patients with POAG. For the morphological study, the ultra-microtome sections were observed using an electron microscope. For the light microscopic immunohistochemical analyses, frozen sections were stained by the avidin-biotin complex method using anti-type iv collagen, anti-type vi collagen, anti-heparan sulfate proteoglycan (hspg), anti-fibronectin or anti-myocillin (myoc) antibody.
Main outcome measures: Comparison of the immunohistochemical localization of ECMs in TM between SG and POAG.
Results: The morphological examinations revealed accumulations of basement membrane-like and fine fibrillar-like materials in the outer TM of SG specimens. Type iv collagen, HSPG and fibronectin antibodies in SG specimens showed a greater degree of staining in the outer TM in comparison to the POAG specimens; in contrast, the other antibodies including the type vi collagen and myoc, did not.
Conclusions: The localization of ecms in the tm is different in sg in comparison to that in poag patients.
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2.9. Anatomical structures in glaucoma: Ciliary body

P052 THE ELECTROPHYSIOLOGY OF ISOLATED HUMAN CILIARY BODY EPITHELIUM (CBE): EFFECTS OF OUABAIN AND BATHING CHLORIDE

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Purpose: To study the characteristics of ion transport across the isolated human ciliary body-epithelium (CBE) and to provide insight on the mechanism of aqueous humor formation of human eye.
Design: Experimental study.

Methods: Fresh isolated human CBE was mounted in an ussing-type chamber. The effects of ion substitution and ouabain on transepithelial electrical parameters were investigated.
Results: The electrical polarity of the transepithelial potential difference (PD) at the aqueous side was positive in some and negative in others. When it was positive, PD, the short-circuit current (SCC) and tissue resistance (RT) across the preparations were 0.56±0.06 mv, 12.03±1.26 μa/cm2 and 48.0±1.7 ωcm2, respectively. While the aqueous side is negative, PD, SCC and RT were0.40±0.05 mv, 9.83±1.14 μa/cm2 and 46.6±1.7 ωcm2, respectively. The electrical polarity of the transepithelial PD was not related to the post-mortem time of eyes. Ouabain (0.01 mm) was applied either to the aqueous or blood side of the isolated human CBE at transepithelial positive or negative PD and the response was observed within 1 to 3 min. When the transepithelial PD was negative on the aqueous side, a biphasic response (first hyperpolarised, then depolarised) of PD and SCC was observed. When the PD was positive, only hyperpolarization, but no depolarization was found. Both PD and SCC of the human CBE were found to depend on the concentration of the CL bath when the transepithelial PD was negative on the aqueous side.
Conclusions: The results suggest that the in vitro human CBE preparations were viable and suitable for studying the ion transport activity. The electrical polarity of the transepithelial PD at the aqueous side of human CBE can be positive or negative and it was not related to post-mortem time of eyes. The na+,k+-atpase was intact and may contribute to the ion transport and maintain the transepithelial PD. CL transport may be important in aqueous humor formation in humans.
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2.12. Anatomical structures in glaucoma: Choroid, peripapillary choroid, peripapillary athrophy

P053 PERIPAPILLARY ATROPHY AFTER ACUTE PRIMARY ANGLE-CLOSURE

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Purpose: To determine the changes in peripapillary atrophy in eyes after acute primary angle-closure (APAC).
Design: Prospective observational clinical study.
Participants: The study included 40 eyes of 38 patients of predominantly Chinese ethnicity.
Methods: The intraocular pressure at the time of presentation was 51.7 ± 12 mmHg (median: 55 mmHg; range: 30- 74 mmHg), and the mean duration of the symptoms was 37.7 ± 69.4 hours (range 1 to 336 hours). A laser iridotomy was performed 3.2 ± 8.4 days (median of 1 day, range 0 to 48 days) after the apac episode leading to a normalization of the intraocular pressure. Color optic disc photographs taken at 2 weeks and at 16 weeks after the attack were morphometrically examined. Peripapillary atrophy was divided into alpha zone and beta zone.
Results: Comparing the baseline measurements with the measurements performed 16 weeks after the APAC episode, the minimal width of alpha zone (0.013±0.056 arbitrary units versus 0.016±0.001 arbitrary units; p=0.23), the maximal width of alpha zone (1.11±1.31 arbitrary units versus 1.31±0.79 arbitrary units; p=0.02), the minimal width of beta zone (0.030±0.122 arbitrary units versus 0.033±0.166 arbitrary units; p=0.93), and maximal width of beta zone (0.62±0.94 versus 0.73±0.98 arbitrary units; p=0.42) did not vary significantly. The optic cup was significantly (p<0.0001) enlarged at the end of follow-up.
Conclusions: Alpha zone and beta zone of peripapillary atrophy did not markedly enlarge in patients after APAC with a short term and marked elevation of intraocular pressure, despite an enlargement of the optic cup during a follow-up of 4 months.
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P054 DIFFERENCES IN PERIPAPILLARY ATROPHY BETWEEN GLAUCOMATOUS AND NORMAL EYES. THE BEIJING EYE STUDY

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Purpose: To determine whether peripapillary atrophy is associated with glaucoma in a population-based study.
Design: Population-based, cross-sectional cohort study.
Participants: The Beijing Eye Study included 4439 subjects out of 5324 subjects invited to participate (response rate: 83.4%).
Methods: After excluding highly myopic eyes, data of 4003 (90.2%) subjects entered the statistical analysis. Glaucomatous optic nerve damage was detected in 93 (2.3%) subjects.
Main outcome measures: Color optic disc photographs (30°) were morphometrically examined. Peripapillary atrophy was divided into alpha zone and beta zone. Glaucomatous optic nerve atrophy was defined by a glaucomatous optic nerve head appearance.
Results: Peripapillary atrophy as a whole and measured separately in four disc sectors was significantly larger and occurred significantly more frequently in the glaucomatous group than in the non-glaucomatous group (beta zone, total area: 1.21± 1.92 mm^2 versus 0.32 ± 0.99 mm^2; p<0.001). In multiple regression analysis, area of beta zone was significantly associated with age (p<0.001), myopic refractive error (p<0.001), and presence of glaucomatous optic nerve damage (p<0.001), with no significant difference between chronic open-angle glaucoma (n=72) and chronic angle-closure glaucoma (n=21) (beta zone area: 1.20 ± 0.39 mm^2 versus 1.19 ± 0.46 mm2; p=0.69).
Conclusions: In a population-based setting, beta zone of peripapillary atrophy is significantly larger and occurs more frequently in glaucomatous eyes than in normal eyes of adult Chinese, with no marked difference between chronic open-angle glaucoma and primary angle-closure glaucoma.
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2.13. Anatomical structures in glaucoma: Retina and retinal nerve fibre layer

P055 RETINAL TAU PATHOLOGY IN HUMAN GLAUCOMA

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Background: Tau protein is essential to microtubule integrity in neurons, and abnormal hyperphorylated tau protein at8 is associated with neurodegenerative diseases such as Alzheimer's disease. Tau protein and abnormal tau at8 were evaluated in human glaucoma to determine whether abnormal tau protein plays a role in glaucomatous neural degeneration.
Methods: Sections from 11 glaucoma eyes and 10 age-matched control eye specimens were immunostained for normal tau protein (bt2) and for hyperphosphorylated tau protein (at8). Measurements of immunofluorescence intensity in glaucoma retinas were compared to those in control retinas. Abnormal tau at8 and parvalbumin, a horizontal cell specific marker, were studied with double-immunofluorescence techniques to determine co-localization.
Results: Normal tau protein was decreased in glaucoma retina compared to age-matched control retina. Abnormal tau at8 was evident within the posterior retina, predominantly in the inner nuclear layer in glaucoma and this was not observed in controls. Quantitative immunofluorescence techniques demonstrated significantly increased abnormal tau at8 in glaucoma compared to controls. Abnormal tau at8 was specifically localized in horizontal cells of the retina.
Conclusions: Abnormal tau at8, a pathologic hallmark of neurodegenerative disorders known as the tauopathies, is present in human glaucoma. Horizontal cells in the retina are implicated in the neurodegenerative process in glaucoma.

P056 THE RELATIONSHIP BETWEEN RETINAL NERVE FIBER LAYER THICKNESS AND OCULAR HEMODYNAMICS

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Purpose: To identify the presence of retinal nerve fiber layer (RNLF) thickness, retrobulbar blood flow velocities and ocular perfusion variability for healthy and open-angle glaucoma subjects.
Design: Prospective cross-sectional study.
Participants: Thirty somatically healthy individuals and 30 open-angle glaucoma subjects.
Methods: Age-gender stratified selection has been applied for target sample formation. Standard scanning laser polarimetry parameters were recorded. Retrobulbar blood flow velocities in the ophthalmic (OA), central retinal (CRA) and short posterior ciliary arteries (SPCA) were assessed using color doppler imaging. Peak-systolic (PSV), end-diastolic (EDV) velocities, pulsatility (PI) and resistivity (RI) indexes were evaluated. Ocular perfusion (OPP) and diastolic perfusion pressures (DPP) were calculated. P values less than 0.05 were accepted as statistically significant.

Main outcome measures: RNLF thickness, retrobulbar blood flow velocities, ocular perfusion pressure.
Results: Decreased RNLF thickness and increased nerve fiber index (NFI) were observed in glaucoma group (p<0.005). Statistically significant blood flow velocity reduction was recorded in OA EDV (p=0.0048) and in CRA PSV (p=0.0308) for glaucoma cases. The mean OPP was 59.10±8.2mmHg and DPP 73.87±9.5mmHg among somatically healthy; respectively 54.20±9.6mmHg and 68.63±7.9mmHg for glaucoma patients. Diminished OA EDV and the CRA PSV indexes regarding to decreased rates of DPP and OPP and decreased RNLF thickness were observed in glaucoma group (p<0.01) and not observed for healthy subjects. Statistically significant moderate Negative correlation was revealed between NFI and OPP, DPP, OA EVD, CRA PSV values (r1=-3.059; r2=-4.06; r3=-0.165; r4=-0.180; p<0.05).
Conclusions: Our data suggest that the association between ocular circulation and nerve fiber layer thickness is observed in glaucoma patients but not in age-matched controls.
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2.14. Anatomical structures in glaucoma: Optic disc

P057 PATTERNS OF OPTIC DISC CHANGE IN EARLY GLAUCOMA AND GLAUCOMA SUSPECT PATIENTS

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Purpose: To determine the most common patterns of optic disc change in early glaucoma suspect patients.
Methods: We prospectively enrolled both eyes of patients into the perimetry and psychophysics in glaucoma (PPIG) study and obtained yearly optic disc photography using simultaneous stereo-paired photography (Nideck 3-dx stereo camera, Tokyo, Japan). Two glaucoma specialists independently graded the baseline and most recent optic disc photographs for glaucomatous changes (optic disc progression). When disagreement occurred, the specialists re-graded these photos together attempting to achieve consensus; a third glaucoma specialist adjudicated any continuing disagreements to arrive at a final determination. The specialists categorized the type of optic disc progression as follows: increased rim thinning (two or more clock hours), new notching (one clock hour or less) of the neuroretinal rim, increased excavation (undermining of the optic disc margin), and new or increased nerve fiber layer defect(s). They also determined the quadrant(s) that these changes occurred. We also determined the sensitivity and specificity for detecting optic disc progression, and the reproducibility of the final determination.
Results: We enrolled 168 patients (96 female, 72 male, 336 eyes) into the study with a follow-up time of at least 4 years (median = 6.1 yrs.). Average age at baseline was 58 (range: 35-87) yrs. The sensitivity, specificity, and reproducibility of the final determination were each 80%. The specialists determined that 91 eyes (27%) showed optic disc progression. Of those eyes with progression, the most common location for progression was the inferior temporal quadrant. Excavation and rim thinning occurred in two or more quadrants in 33% and 31%, respectively, of eyes with optic disc progression.
Conclusion: Optic disc progression occurred frequently in this cohort of glaucoma suspects and early glaucoma patients. When evaluating the optic disc for glaucomatous progression in a similar cohort, eye care providers should pay particular attention to increased excavation and neuroretinal rim thinning.

P058 CORRELATION BETWEEN CENTRAL CORNEAL THICKNESS AND OPTIC DISC DEPTH IN SHORT-TERM IOP INCREASE

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Aim: The aim of the study was to assess correlation between central corneal thickness (CCT) and optic disk cup depth increase in short-term intraocular pressure (IOP) elevation in patients with primary open-angle glaucoma (54 patients, 98 eyes, mean age 64±2,27 years), ocular hypertension (5 patients, 9 eyes, mean age 68,29±2,08) and healthy volunteers (37 people, 61 eyes, mean age 48,4±6,57 years). The study was designed as a nonrandomized prospective clinical trial.
Methods: The mean cup depth (MCD) of the optic disc was evaluated with the Heidelberg Retinal Tomographer (HRT-III). After baseline examination suction cup was used to increase IOP for 10 mmHg above baseline and MCD was determined again. IOP was controlled with 'Pascal' dynamic contour tonometer before and during suction. IOP increase resulted in MCD increase in all cases. The difference of MCD before and during suction was assessed. CCT was measured with ultrasound pachimetry.
Results: No correlation was found between CCT and optic disk cup depth increase in IOP elevation in all groups. There was no difference in value of correlation coefficients between the investigated groups.
Conclusion: Thus, no evidence was received, proving the impact of CCT on the biomechanical properties of the optic disc.
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P059 COMPARISON OF OPTIC DISC SIZE BETWEEN PRIMARY OPEN-ANGLE GLAUCOMA PATIENTS AND NORMAL SUBJECTS

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Purpose: To investigate and compare the optic disc size between primary open-angle glaucoma (POAG) patients and normal subjects.
Subjects and Methods: From March 2005 to April 2006, 157 primary open-angle glaucoma patients who were diagnosed at the Kyoto Prefectural University of Medicine and 474 normal subjects were enrolled in this study. Normal subjects were all volunteers, and prior informed written consent was obtained from each individual. Those subjects were confirmed to be normal by glaucoma specialists using FDT screening n-30 (Carl Zeiss Meditec, Jena, Germany), non-mydriatic optic disc photographs TRC-NW200 (Topcon, Tokyo, Japan) and non-contact tonometer RKT-7700 (Nidek, Gamagori, Japan). All study participants underwent HRT-II measurement (Heidelberg Retina Tomograph-II, Heidelberg Engineering GmbH, Heidelberg, Germany) for both eyes. After measuring with HRT-II, the right eyes were chosen for further statistical analysis (Mann-Whitney u test and f test).
Results: the mean optic disc area of POAG patients and normal subjects were 2.27±0.75 and 1.88±0.49mm2, respectively. The mean optic disc area of POAG patients was significantly larger than that of normal subjects (Mann-Whitney u test; $p<0.0001$). In addition, the dispersion of optic disc area of POAG patients was significantly larger than that of normal subjects (f test; $p<0.05$).
Conclusion: in POAG patients, the optic disc size and its dispersion were both significantly larger than those of normal subjects.
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P060 OPTIC DISC MORPHOLOGY IN OPEN-ANGLE GLAUCOMA VERSUS ANGLE-CLOSURE GLAUCOMA IN SOUTH INDIA

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Purpose: To investigate differences in the optic disc appearance between patients with angle-closure glaucoma versus open-angle glaucoma.
Study Design: Cross-sectional observational study.
Participants and/or controls: Two groups of patients (primary open angle glaucoma (POAG) and primary angle closure glaucoma (PACG) who satisfied the inclusion and exclusion criteria were included. POAG were diagnosed in presence of characteristic changes in the optic disc and corresponding typical defects in the visual field for with intraocular pressure more than 21 mmHg. Based on the mean deviation value, patients can be classified into early, moderate and severe glaucoma. PACG were diagnosed in presence of sign of angle closure on gonioscopy with characteristic changes in the optic disc and corresponding typical defects in the visual field with IOP more than 21 mmHg.
Main outcome measures: Stereoscopic colour optic disc photographs were qualitatively and quantitatively assessed using unpaired t test.
Results: 60 patients with angle-closure glaucoma and 52 patients with open-angle glaucoma were included. Both study groups did not differ significantly ($p=0.7$) in visual field loss, age, refractive error and gender. Table 1 shows quantitative and qualitative parameters in POAG and PACG groups. In the POAG group compared with the PACG groups, frequency of localized retinal nerve fiber layer was less frequent. ($p=0.04$). Both groups did not vary significantly in optic disc size, and shape, frequency of detected disc hemorrhages, frequency of neuroretinal rim notches.
Conclusions: At a given amount of glaucomatous optic nerve damage as measured by white on white perimetry, eyes with open-angle glaucoma and eyes with angle-closure glaucoma do not show significant differences in the optic nerve head appearance.

P061 COMPARING TWO CLINICAL STRATEGIES TO DESCRIBE THE OPTIC NERVE HEAD

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Objective: Optic nerve head (ONH) evaluation is a mainstay in OAG diagnosis. Armaly introduced us to the vertical c/d ratio concept and more recently Spaeth et al designed the DDLS: disk damage likelihood scale. Our objective is to find a correlation between these strategies to describe the ONH.
Design: We hypothesized that clinical vertical c/d ratio and DDLS values correlate and are comparable to computerized imaging values of the ONH. The study design is an observational case series.
Materials and Methods: Patients with OAG and OAG suspects having clinical vertical c/d ratio, DDLS and computer-

ized imaging with HRT and OCT of the ONH were included. A Pearson test was used to compare the clinical DDLS and c/d ratios. With anova we evaluated the correlation between clinical and computerized imaging values of c/d ratio and DDLS. Statistical significance was preset at p<0.01.
Results: We evaluated 31 optic nerves from 16 patients. Pearson test comparison of clinical vertical c/d ratio and DDLS result is r : 0.496 (p>0.01). Anova test for clinical and imaging c/d ratio result is f:12,42 (p<0,05), and for clinical and imaging DDLS result is f:0,843 (p=0.43).
Conclusion: We showed a clinical correlation between vertical c/d ratio and DDLS values. While clinical c/d values are reproducible in HRT or OCT, DDLS values are more variable. We need a larger group of patients to evaluate the computerized imaging documentation of DDLS.
Discussion: DDLS introduces a variable not taken previously into account in the classical vertical c/d ratio evaluation: the disc's dimensions. Furthermore, DDLS emphasizes on the remnant neural rim. Graphic documentation of these parameters requires objective measuring. While reproducibility of the vertical c/d ratio is moderate6, its concept lacks the importance of the disc size. DDLS integrates discs dimensions and neural rim remnant in the concept, and while reproducible among observers, it lacks an objective way of documentation.
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P062 THE AFRICAN DESCENT AND GLAUCOMA EVALUATION STUDY (ADAGES): RACIAL DIFFERENCES IN OPTIC NERVE STRUCTURE
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Purpose: To compare the structure of the optic nerve and retinal nerve fiber layer (RNLF) between healthy participants of African descent (AD; n=190) and European descent (ED; n=194) obtained from the prospective, longitudinal, multicenter observational cohort study, adages (n=1,224).
Design: Cross-sectional comparative study.
Participants: Three hundred eighty-four eyes (1/subject) (324 from adages and 60 from the diagnostic innovations in glaucoma study) were included that had a normal fundus exam, normal visual fields, normal optic disc stereophotos, and an IOP <22 mmHg.
Methods: Optic nerve topographic information was obtained using CSLO and OCT imaging, and RNLF thickness measurements were obtained using CSLO, OCT, and SLP imaging. Categorical variables were compared using Fisher's exact test and continuous variables with the two-sample student's t-test. The least-squared method was used for adjusted comparison accounting for differences in disc area.
Main outcome measures: Quantitative estimates of optic disc and RNLF structure.
Results: The areas of the optic disc and cup were larger with deeper cups in eyes from individuals with AD compared to those with ED, while the neuro-retinal rim was larger in the ad group. These differences were not significant following adjustment for differences in disc area. The Moorefield regression analysis (MRA) performed with high specificity (99.4% ad, 100% ED), while the glaucoma probability score (GPS) showed a lower specificity in the ad group (83% ad, 89% ed; p- 0.021).
Conclusions: Significant differences in optic nerve morphology were seen between healthy eyes from persons of AD and ED and must be taken into account when interpreting results of diagnostic imaging in differing demographic groups. These differences are largely related to variation in optic disc area. Diagnostic methods that take into account differences in optic disc area, such as MRA, have a higher specificity in individuals of African descent.
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2.16. Anatomical structures in glaucoma: Chiasma and retrochiasmal central nevrous system

P063 NOVEL NG2 GLIAL CELLS EXPRESS NMDA RECEPTORS IN THE OPTIC TRACT AND LATERAL GENICULATE NUCLEUS IN PRIMATE GLAUCOMA
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Purpose: 1. To determine whether NG2 cells exist in normal and/or glaucomatous optic tract and lateral geniculate nucleus (LGN). 2. To determine whether NG2 cells express nmda glutamate receptors.
Methods: Eight monkeys with right eye unilateral experimental glaucoma and three normal control monkeys were studied. Optic tract and LGN layers were studied for evidence of NG2 immunolabeling. NG2 chondroitin sulfate

proteoglycan immunoreactivity was detected using super sensitive non-biotin hrp detection kit (Biogenex, CA, USA). Double-labelling for NG2 and NMDA receptor subunit 1 was performed with immunofluorecence using tyramide signal amplification kit (Molecular Probes, CA, USA). Colocalization studies of dual-color confocal images were performed using Manders' overlap and Pearson's correlation coefficients.
Results: In the normal optic tract and LGN, NG2-immunoreactive star-shaped cells with branching processes were detected. In glaucoma, NG2 cells were more easily identifiable in both optic tract and LGN. Colocalization studies in both normal and glaucomatous optic tract and lgn, showed the expression of NMDA receptor subtype 1 in NG2 cells.
Conclusions: The NG2 glial cells represent a novel glial cell type in normal and glaucomatous optic tract and LGN. The expression of NMDA glutamate receptor in NG2 cells suggests their role in the glutamatergic system, and neural degeneration in glaucoma.

2.17. Anatomical structures in glaucoma: Stem cells

P064 ACTION OF P38 AND ERK1/2 ON DIFFERENTIATION INTO NEURON-LIKE CELLS FROM RHESUS MONKEYS MESENCHYMAL STEM CELLS

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Objective: To investigate the role of p38 and ERK1/2 on rhesus monkeys mesenchymal stem cells differentiated into neuron-like cells.
Design: Experimental study.
Methods: To induce the neuronal phenotype, rhesus monkeys mesenchymal stem cells (MSCS) were incubated with AD-EGFP. Rhesus monkeys mesenchymal stem cells and AD-EGFP-infected stem cells were induced by 500ng/ml sonic hedgehog (SHH) for 24 hours. The expression of an early neuronal marker, neuron-specific enolase (NSE) was identified by immunocytochemistry. Under transmission and scanning electron microscope, ultra-structure of the differentiated cell were observed. Western blot analysis the change of p38 and ERK1/2 during MSCS differentiated into neuron-like cells. The role of p38 special inhibitor SB203580 and the ERK1/2 special inhibitor PD98059 in MSCS differentiated into neuron-like cells was observed in real time under phase contrast microscope. The role of overexpression of recombinant adenovirus ad-mek1 (CA), ad-ERK (Wild), and ad-p38 (AGF, mutant) during MSCS differentiated into neuron-like cells was also observed by fluorescence microscope.
Main outcome measures: Immunocytochemistry, microscopy, flow cytometry, and western blotting assay.
Results: During MSCS differentiated into neuron-like cells by SHH, mitogen-activated protein kinases (MAPKS) involved in their signal transduction, p38 was activated and ERK1/2 was inhibited. P38 inhibitor SB203580 increased induced differentiation time compared with normal induced cells, and inhibited neurite outgrowth. The induced cells infected AdMEK1(CA), and Ad-p38 (AGF,mutant) were longer than cells infected with Ad-EGFP in differentiation time, and neurites of differentiated cells were shorter than the cells infected with AD-EGFP.
Conclusion: The activation of p38 and inhibition of ERK1/2 were impacted on differentiation into neuron-like cells from rhesus monkeys mesenchymal stem cells induced by sonic hedgehog, which may has potential application on neuroprotection of stem cells in glaucoma.
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P065 RA-INDUCED CHANGES OF FIVE PROTEIN KINASE C ISOFORMS EXPRESSION IN DIFFERENTIATION OF MOUSE EMBRYONIC STEM CELLS INTO NEURON-LIKE CELLS

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Objective: Protein kinase c (PKC) is expressed in many kinds of cells, however, its dynamic expression in neuronal differentiation of embryonic stem cells (ES cells) is still unknown.
Design: Experimental study.
Main outcome measures: We investigated PKCα, PKCβ, PKCγ, PKCδ and PKCε expression in differentiation of mouse ES cells into neuron-like cells by treatment with all-trans retinoic acid (RA) in an attempt to elucidate their roles in differentiation.
Methods: ES cells were subjected to an 18 day induction procedure which consisted of 4 days of culture as embryoid bodies without RA followed by 14 days of culture in the presence of 5×10-7 RA.
Results: Immunohistochemistry studies demonstrated that PKCα was constantly expressed in stem cells and the arising cell types. PKC was detected in all differentiated cell types, whereby PKCβ, PKC', and PKCε were solely found in the neuronal derivatives. Western blot analyses showed that PKCβ, and ' were constitutively expressed but the expression of PKCα was down-regulated rapidly and PKC', and ε was up-regulated three days after addition of RA. While the protein levels of the PKC isoforms α, ', and ε resumed to original levels after d7, when the major phenotypical alterations of the developing neurons were completed. Although similar results of PKC isotype gene expression

by RT-PCR analysis occurred, they did not fully recapitulate protein expression.
Conclusions: This study was characterized the PKC isoenzymes profile in RA-induced differentiation of ES cells into neuron-like cells and suggests that PKC isoforms may play a very important role in differentiation of mouse ES cells along the neuronal pathway and would offer the new potential alternative seeding cells to treat glaucoma and other retinal degenerated diseases.
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2.20. Anatomical structures in glaucoma: Other

P066 THE INFLUENCE OF EXTRAOCULAR MUSCLES TO IOP AND ITS APPLICATION TO GLAUCOMA TREATMENT

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Objective: IOP has been thought regulated by the aqueous humor formation rate and its drainage resistance. Both of them are intraocular factors. However the tonus of extraocular muscles and their rhythmical movements also have been found great factors to IOP. Excessive tonus of extraocular muscles and loss of its rhythmical movements increase IOP. When the eyeball receives the excessive pressure force by excessive contraction of extraocular muscles, IOP increases. And when the loss of rhythmical movements of extraocular muscles happens, IOP also increases. The aqueous humor circulation can be maintained not only by the hydrostatic pressure gap between intra and extra eyeball, but the dynamic movements of the eyeball driven by extraocular muscles are found even more essential. The rhythmical movements of the eyeball help the aqueous humor circulation. It provides an eyeball with pump effect.
Design: The mechanism can be proved by applying a skeletal muscle relaxant ophthalmic solution to hypertension and non-hypertension eyes. Dantrolene sodium solution of very low concentration is used for the ophthalmic solution. Since dantrolene sodium is a skeletal muscle relaxant, the ophthalmic solution affects only extraocular muscles but not intraocular muscles. The ophthalmic solution releases the excessive tonus of extraocular muscles and recovers rhythmical movements of extraocular muscles, and then releases excessive IOP.
Participants and controls: Four hypertension eyes and 1 normal tension eye, one steroid-induced hypertension eye is included.
Method: At first the IOP is measured by the non-contact tonometer, Topcon ct-50the, before the dantrolene sodium ophthalmic solution of 100 ppm is applied for 2 times with 5 minutes interval to participants' eyes. Then the IOP mesurements are performed for 3 times every 10 minutes after the ophthalmic solution is applied.
Main outcome measures: IOP.
Results: The IOP of the hypertension eyes has already started decreasing at 10 minutes after applying the ophthalmic solution, and continue to decrease until the third measurement of IOP. On the other hand the IOP of the normal tension eye does not change. The result is shown in the graph.
Conclusions: The results show that the IOP is highly affected by the tonus of extraocular muscles. The excessive tonus of extraocular muscles has been found to result in the excessive IOP. Therefore the extraocular muscles' tonus control should be realized essential to IOP control. Now we may have a new IOP control method by looking at the extraocular muscles' tonus.
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3. LABORATORY METHODS

3.4. Laboratory methods: Molecular genetics

P067 INVESTIGATION OF THE HLA DRB GENES IN UKRAINIAN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Purpose: The aim of this study was to determine whether the DNA polymorphism located in the HLA DRB1 genes show a specific association pattern in Ukrainian patients with primary open-angle glaucoma.
Design: This was a cross-sectional, case-control, multicenter study.

Participants and controls: There were examined 80 patients with primary open-angle glaucoma. The control group consisted of 20 healthy people.
Methods: Blood samples were obtained from the cubital vein. DNA was extracted and HLA typing was performed by polimeraze-chain reaction.
Main outcome measures: The frequencies of HLA DRB1 gene were investigated.
Results: We documented increased frequencies of HLA DRB1*11(05) and HLA DRB1*05(15) but none of them were significantly different from normal control subjects. Haplotype analysis showed that the HLA DRB1*01 and HLA DRB1*13 haplotype is significantly increased in patients compared with control subjects.
Conclusions: The haplotype HLA DRB1*01 and HLA DRB1*13 was increased in our patients (haplotype frequency = 0.275 and 0,325, p = .0001). This may reflect the association of this haplotypes with the disease. Further studies are needed regarding the genetic susceptibility to develop primary open-angle glaucoma.
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P068 RECURRENT MYOCILIN ASN480LYS GLAUCOMA CAUSATIVE MUTATION ARISES DE NOVO IN A FAMILY OF ANDEAN DESCENT
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Purpose: To identify and characterise MYOC mutations in a group of 11 primary open-angle glaucoma (POAG) families of South American native and admixed origins from Peru.
Participants and Methods: Patients and relatives participated voluntarily after signing informed consent. Ophthalmic examination included open anterior-chamber angles, presence of glaucomatous optic disc changes, slit lamp, gonioscopy, intraocular pressure and pachymetry. DNA was obtained from 5 ml of peripheral blood, MYOC exons were amplified and analysed under 'conformational sensitive gel electrophoresis (CSGE) and sequenced to detect and identify mutations.
Results: Two mutations were found. In a family of admixed andean, caucasian and probably African descent, a common known polymorphism MYOC arg76lys (r76k) cosegregated with POAG in 6 out of the 7 POAG patients, but also present in 6 normal relatives. Another family of native Andean descent presented a MYOC mutation asn480lys (n480k), previously reported to be causative in two unrelated French and Dutch familiar groups with glaucoma of variable expressivity (nucleotide 1440 c→a). The Peruvian n480k mutation is caused by a different transversion (nucleotide 1440 c→g), revealing a third, independent event. N480k is the mutation reported in the highest number of POAG patients (> 90 cases) and has been proposed as a model to study a common mutation with variable phenotypic presentation to study other modulating environmental and genetic factors for expressivity.
Conclusions: A screening of MYOC mutations of 11 POAG families revealed an independent nucleotide mutation 1440 c→g in an Andean family that lead to n480k aminoacid change, the most common causal mutation reported for POAG. Follow-up of the evolution of POAG in this andean family and comparison with European n480k, will contribute to the information about disease manifestation, progression and treatment response in the context of a distinct ethnic background as well as climatic, altitude and socioeconomical conditions.
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3.4.1. Laboratory methods: Molecular genetics: Linkage studies

P069 ASSOCIATION BETWEEN THE BDNF GENE POLYMORPHISM AND NORMAL TENSION GLAUCOMA
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Objective: The c.196 g/a polymorphism of the brain-derived neurotrophic factor (BDNF) gene has been associated with central nervous diseases such as Alzheimer's disease. It is therefore possible that the bdnf allele is a common risk factor for neurodegeneration, therefore be associated with

glaucoma, especially normal tension glaucoma (NTG). We assessed whether the BDNF c.196 g/a polymorphism is associated with NTG.
Design: Prospective case-control association study.
Participants and controls: One hundred ninety three Japanese patients with NTG and 185 control subjects without glaucoma.
Methods: Genomic DNA was examined in the patients with NTG and the control subjects. The mean age at the time of blood sampling was 63.7 ± 13.5 years (mean ± SD) in the patients with NTG and 65.5 ± 11.5 years in the control subjects. The BDNF c.196 g/a genotype and allele frequencies were determined using a pyrosequencing analysis, as previously described.
Main outcome measures: The BDNF c.196 g/a genotype and allele frequencies were compared between the NTG patients and control subjects.
Results: No significant difference was observed (p = 0.94, chi-square test) regarding the BDNF c.196 g/a genotype between the NTG patients (aa: 11.9%, ga: 56.0%, gg: 32.1%) and the control subjects (aa: 10.8%, ga: 56.8%, gg: 32.4%). Additionally, there was no significant difference (p = 0.88, Fisher's exact test) in the frequencies of the BDNF c.196 g/a alleles between the NTG patients (a allele: 39.9%, g allele: 60.1%) and the control subjects (a allele: 39.2%, g allele: 60.8%).
Conclusion: The BDNF c.196 g/a polymorphism was not found to be associated with NTG. Further studies utilizing in the different ethnic populations are desirable to elucidate the relationship between BDNF and NTG.
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P070 NOVEL MUTATION IN THE MYOCILIN GENE IN A CAUCASIAN FAMILY WITH OPEN ANGLE GLAUCOMA

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Purpose: To describe a novel mutation in the myocilin (MYOC) gene in a Caucasian family with juvenile open angle glaucoma and to propose its clinical relevance.
Design: Case series.
Participations and control: A family with four affected individuals and one carrier over three generations.
Methods: We describe a family with four affected individuals and one carrier over three generations. The proband, a girl aged 14 years, has progressive juvenile open-angle glaucoma, and her mother, maternal aunt and maternal grandfather all suffer from progressive open-angle glaucoma that started at an early age. All four have undergone trabeculectomy. A cousin was found to be genetically affected, but she is currently healthy. We carried out mutation analysis of the myocilin gene in this family.
Main outcome measures: Gene mutation.
Results: After screening the myoc gene, we detected a novel mutation in exon 3. This mutation, y371d, has not, to the best of our knowledge, been reported before.
Conclusions: We have identified a novel mutation in the myocilin gene, y371d, in a Caucasian family who presented with early onset progressive primary open angle glaucoma requiring trabeculectomy.
References:
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P071 NOVEL MUTATONS IN CYP1B1 GENE IN TURKISH PRIMARY CONGENITAL GLAUCOMA PATIENTS AND GENOTYPE-PHENOTYPE CORRELATION

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Objective: To report of novel mutations in cyp1b1 gene in three turkish patients with primary congenital glaucoma (PCG) and to evaluate genotype-phenotype correlation.

Design: Case series (clinical diagnosis and genetic testing study).
Methods and testing: We evaluated three Turkish patients with PCG, two of them are brother and sister in a family (case 1 and 2). All patients have increased intraocular pressures (IOPS) and buphthalmos (corneal edema and enlargement). All of them needed more than one surgical intervention (filtration surgery) to control IOPS. Single conformational polymorphism-restriction polymorphism length fragment (SSCP-RFLP) analysis and direct sequencing of cyp1b1 gene were the methods used for screening 3 PCG patients and their families.
Results: Novel compound heterozygous mutations (missense mutation) were detected in cyp1b1 gene in case 1 and 2 (r117w-r469w). The r117w mutation was identified in the mother of case 1 and 2, but she was normal phenotypically (non-penetrance). We detected another novel homozygous mutation in case 3 (g329v).
Conclusion: The genotype-phenotype correlation is useful in detecting and interpreting novel mutations. There can be modifier gene effect in the family with r117w mutation.
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P072 LACK OF ASSOCIATION BETWEEN INTERLEUKIN-1 GENE CLUSTER POLYMORPHISMS AND GLAUCOMA IN CHINESE SUBJECTS
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Purpose: Single nucleotide polymorphisms (snps) within the IL-1 gene cluster on chromosome 2q13 has been reported recently to be associated with reduced risk for primary open angle glaucoma (POAG) in caucasians. Our aim was to investigate if these associations occur in Chinese patients with POAG and primary angle closure glaucoma (PACG).
Design: A case-control study of the snps within the IL-1 gene cluster and its association with Chinese patients with POAG and PACG.
Participants: 194 POAG and 125 PACG patients with 79 normal control Chinese patients were recruited in the study. POAG patients consisted of 94 normal tension glaucoma (NTG) patients and 100 high tension glaucoma patients (HTG). Standardized inclusion criteria for glaucoma, which was the presence of glaucomatous optic neuropathy, defined as loss of neuroretinal rim with a vertical cup-to-disc ratio of 0.7 or greater, with compatible visual field loss. NTG was defined as a mean intraocular pressure (IOP) without treatment that was consistently less than 21 mmHg on diurnal testing and HTG was defined as patients with IOP higher than 21 mmHg. All PACG patients had at least 180 degrees of angle closure on gonioscopy.
Methods: All patients recruited into the study underwent complete ophthalmological examination. Genotypes were determined by polymerase chain reaction and restriction digest enzymes at IL1a (-889c/t), IL1b (+3953c/t) and IL1b (-511c/t) loci. The association of individual snps with glaucoma was evaluated using chi-square testing. Haplotype analysis was performed using phase program with haplotype frequency estimated for combined cases and controls assuming Hardy-Weinberg equilibrium of haplotypes.
Results: The frequency of the IL1a (-889t) allele was higher in the control group (10.8%) than the POAG (7.0%) and PACG (6.8%) group. However, this was not statistically significant. The distribution of the other 2 IL1b polymorphisms were not statistically different between the POAG, PACG and normal controls, or between HTG and NTG. Haplotypes analysis showed no significant difference between HTG, NTG, PACG and the normal controls.
Conclusion: This study did not find an association between IL-1 gene cluster polymorphisms and glaucoma in this sample of Chinese subjects.
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3.4.2. Laboratory methods: Molecular genetics: Gene studies

P073 IMPLICATIONS OF DIFFERENTIAL EXPRESSION GENES STUDY BY OLIGO MICROARRAY TECHNIQUE IN RETINA OF SD RAT WITH CHRONIC HIGH IOP
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Objective: To search and find differential expression genes and their dynamic changes at retina of rat model with chronic elevation of IOP.
Design: Compared with itself and alignment research. The retina of right eye was experimental eye and the left was contral.

Method: Using 532-nm diode laser burned trabecular meshwork and episcler veins of SD rats and resulted in a chronic elevation of IOP for 3 months. A total of 6 RNA samples from the model retina at different time points (7d, 35d, 60d, 90d,180d, 360d) were obtained. Six pairs oligo microarray of 35,000 points were screened and identified differential expression genes that related to chronic high IOP retina injury.
Results: In total 1692 differential expression genes were found. The 719 higher expressed genes (ratio≥2) were classificated according to their function. The functions were entirely unknown in the 54% of among them. The others were sorted into 13 functional groups. The largest two were related to transcript regulating and signal transducting. The over-expressed genes (ratio≥7) were mostly concerned with synthesis of protein, material transduction and metabolism. The 1692 differential expression genes were some clustered into 16 groups and analysed each group expression trend according to the time site. The function gene group was varied at different times during high IOP and lower down after.
Conclusion: High IOP could result in a large of group genes change at retina. With the time the functional gene groups were varied. It implicated the single gene fouction research was limited to elucidate any biologic activties.

P074 LACK OF ASSOCIATION BETWEEN THE RS2664538 POLYMORPHISM IN THE MMP-9 GENE AND PRIMARY ANGLE CLOSURE GLAUCOMA IN SINGAPOREAN SUBJECTS

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Purpose: A recent study identified the single nucleotide polymorphism (SNP) rs2664538 within the MMP-9 gene with risk for acute primary angle closure glaucoma (PACG). The aim of this study was to confirm this association in Singaporean subjects with both acute and chronic PACG.
Design: Observational cross-sectional study.
Participants: A total of 217 subjects with PACG (consisting of 85 acute and 132 chronic PACG), and 83 normal control Chinese subjects were studied.
Methods: Genomic DNA was extracted from leukocytes of peripheral blood and genotypes determined by polymerase chain reaction (PCR) and direct sequencing. The association of the SNP with PACG was evaluated using chi-squared tests.
Main outcome measures: Genotypes as determined by PCR and sequencing.
Results: There was no significant difference in the rs2664538snp or allele frequencies for acute or chronic PACG subjects compared with controls. (table 1) (table 2)
Conclusions: This study did not find an association between the rs2664538 polymorphism within the MMP-9 gene and PACG in this sample of Chinese subjects.
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P075 IDENTIFICATION OF FOXC1 VARIATIONS IN INDIAN PRIMARY CONGENITAL GLAUCOMA (PCG) CASES

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Objective: Primary congenital glaucoma (PCG) is a developmental anomaly of trabecular meshwork and anterior chamber angle with cyp1b1 as a candidate gene. Screening of 295 PCG cases at our centre revealed 88 (25.08%) homozygous, 14 (4.74%) compound heterozygous and 42 (14.23%) heterozygous for cyp1b1. However, 165 (55.93%) did not show any mutation. PCG being an autosomal recessive anomaly requires two mutant alleles for disease manifestation. Hence we screened myoc (another candidate for glaucoma, suggested to interact with cyp1b1 through common biochemical pathways) in 178 (33 heterozygous and 145 non-cyp1b1) cases, which revealed digenic inheritance of cyp1b1 and myoc in one case and heterozygous q48h mutation in 6 (3.37%) cases. In the present study we screened these 178 cases for foxc1 a forkhead transcription factor, involved in development of anterior chamber angle, associated with anterior segment dysgenesis (ASD) leading to secondary glaucoma in ~50% cases. Also, foxc1 knockout mouse showed anterior chamber angle abnormalities similar to human PCG and ara cases. Hence we selected it as a candidate for screening in our patients.
Design: Experimental study.
Participants: A cohort of 39 heterozygous cases (33 for cyp1b1 and 6 for MYOC), a case with MYOC and cyp1b1 digenic inheritance and 138 without any mutation alongwith 150 controls (iop<21 mmHg, c:d ratio< 4 and corneal diameter <12 mm).
Methods: Forkhead domain (FHD), an evolutionary conserved, functionally important DNA binding domain with majority (72%)5 of asd associated mutations clustered in this region, was screened by resequencing the remaining coding region, harboring minor proportion of mutations, was screened by single stranded conformation polymorphism (SSCP).
Outcome measures:Association of foxc1 variations with PCG.

Results: Among 178 cases, so far FHD domain has been partially screened in 57, which revealed 3 heterozygous variations in 2 PCG families. Two of these were missense (I130f and v456i) and third was a frameshift (g.1927dup25). The v456i and g.1927dup25 were novel whereas I130f was a reported pathogenic mutation in ara6. The I130f and v456i were identified in single PCG family, where proband was heterozygous for cyp1b1 (r368h) mutation. Proband's unaffected sibling was heterozygous for r368h and v456i, but normal for I130f. All three variations were absent in unaffected father and 84 controls. The g.1927dup25 was identified in another PCG family that showed no involvement of cyp1b1 and MYOC. The proband's unaffected father and 150 controls were normal for variation. In both PCG families, mother's DNA was not available for analysis.
Conclusion: The first report identifying foxc1 variations in PCG, suggesting it as a candidate gene for PCG.
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P076 UNDERSTANDING THE INVOLVEMENT OF THE CYP1B1 PROMOTER IN PRIMARY CONGENITAL GLAUCOMA

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Objective: Primary congenital glaucoma (PCG), which is a developmental anomaly of the eye, has been attributed to mutations in a candidate gene cyp1b1 worldwide. While the coding regions of cyp1b1 have exhibited varying proportion of mutations, the promoter region has been rarely implicated in PCG3. The present study was therefore aimed at understanding the involvement of the cyp1b1 promoter in a large cohort of PCG cases (n=250) with and without cyp1b1 mutations.
Design: Experimental study.
Participants: The cohort comprised of 250 PCG cases based on preset inclusion and exclusion criteria along with 250 ethnically matched unrelated normal controls. Among the cases, only 53% harbored a cyp1b1 mutation, of which, 39% were either homozygous or compound heterozygous for the mutant alleles.
Outcome measures: Association of genetic variants in the promoter region of cyp1b1 with PCG.
Methods: The entire promoter region of cyp1b1 was screened by resequencing with pre-designed primers and amplification conditions. Four new single nucleotide polmorphisms (SNPS) were observed in addition to the five SNPS screened earlier in this cohort. Test of Hardy-Weinberg equilibrium, estimation of allele frequencies, linkage disequilibrium and haplotype analysis were performed with the Haploview software.
Results: The cases and controls conformed to Hardy-Weinberg equilibrium. Among the 4 new SNPS, three were observed in the promoter region and one in the first intron. Two haplotype blocks were noted for the promoter (2 haplotypes) and the coding regions (7 haplotypes) amongst the cases and controls. The variant 'c' allele at 2805 position was significantly associated with the cases and contributed exclusively to the risk haplotype c-c-g-c-g-g-t-a, which was more than 2-folds higher than the controls (p=1.77x10-8). Similarly, presence of the wild type 't' allele at that position (t-c-g-t-g-t-c-c-a) contributed to the 'protective haplotype', which was 2-folds higher than the cases (p=7.53x10-12). Sub-classification of the cases into different mutation categories indicated that the risk haplotype was contributed largely by cases having a cyp1b1 mutation (p=8.07x10-15) and this association was further strengthened by those cases that had the homozygous and/or compound heterozygous mutant alleles (p=3.21x10-16). Cases with one or no copy the mutant cyp1b1 allele did not exhibit any significant risk with respect to these SNPS or haplotypes similar to the controls.
Conclusion: The data indicates an involvement of the variant promoter SNP (2805t>c) amongst PCG cases. The snps from the promoter along with those observed in the coding regions indicated an extended haplotype that was consistent with the 'risk' and 'protective' haplotypes observed earlier4. Further sub-analysis indicated that the major 'risk' haplotype was associated only with cases where the mutant allele was present in the homozygous or compound heterozygous state. This could be used in devising molecular diagnostics for predictive testing.
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3.5. Laboratory methods: Molecular biology incl. SiRNA

P077 NOVEL CATIONIC NANOPARTICLES MEDIATED SIRNA TARGETING IKK-? INHIBITS THE PROLIFERATION OF HUMAN TENONS CAPSULE FIBROBLASTS IN VITRO

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Objectives: To determine the protection and transfection capacity of novel cationic nanoparticles [chitosan-graft-poly(ε-caprolactone)] as a delivery vector of small interfering RNA (SIRNA), and the suppressive effect of SIRNA targeting IKK-β on the proliferation of human Tenon's capsule fibroblasts (HTFs) in vitro.
Design: Experimental study.
Methods: The SIRNA condensation ability of the novel cationic nanoparticles was measured by electrophoretic mobility assay. The transfection efficiency of this SIRNA vector was performed by confocal microscopy and flow cytometry. Several concentrates of SIRNA targeting IKK-β was transfected into HTFs, and then the MRNA level of IKK-β was assessed by real-time rt-PCR and the protein expression was determined by western blotting assay. We also investigated the viability of HTFs by alamar blue absorbance assay 96 hours after SIRNA transfection.
Main outcome measures: Confocal microscopy, flow cytometry, alamar blue absorbance assay, real-time rt-PCR and western blotting assay.
Results: The copolymer of sirna and cationic nanoparticles

migrated at different speeds due to various n/p charge ratios between them, and the migration was completely retarded when the n/p charge ratio was above three. Moreover, the transfection efficiency of cationic nanoparticles reached 30%-70%, which was similar as lipofectamine 2000 control group. The expression of IKK-β was significantly suppressed at both MRNA ($p<0.05$) and protein level after SIRNA transfection. The proliferation of in vitro cultured HTFs was inhibited at all concentrations of SIRNA in different rates compared with Negative control group ($p<0.05$), and the strongest inhibition was observed at 50nmol/l or above.
Conclusions: RNA interference mediated by cationic nanoparticles could inhibit the proliferation of HTFs in vitro, which provides a new insight to the clinical practice for modulating scar-formation in filtration surgery of glaucoma.
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1. Mao HQ, Roy K, Troung-Le VL, et al. Chiosan-DNA nanoparticles as gene carriers: synthesis, characterization and transfection efficiency. Journal of Controlled Release 2001; 70: 399-421. 2. Hass J, Ravi K, Borchard G, et al. Preparation and characterization of chitosan and trimethyl-chitosan-modified poly-(ε-caprolactone) nanoparticles as DNA carriers. AAPS Pharm Sci Tech 2005; 6: e22-e30. 3. Mao SR, Neu M, Germershaus O, et al. Influence of polyethylene glycol chain length on the physicochemical and biological properties of poly(ethylene imine)-graft-poly(ethylene glycol) block copolymer/sirna polyplexes. Bioconjugate Chem 2006; 17: 1209-1218. 4. Naruse S, Yamada J, Hamuro J, et al. Apc0576 decreases production of pro-inflammatory chemokine and extracellular matrix by human Tenon's capsule fibroblasts. Experimental Eye Res 2004; 79: 223-230. 5. Liang MC, Bardhan S, Li CM, et al. Jesterone dimer, a synthetic deriative of the fungal metabolite jesterone, blocks activation of transcription factor nuclear factor κb by inhibiting the inhibiter of κb kinase. Mol Pharmacol 2003; 64: 123-131. 6. Supported by grants from the Scientific ReseArch Foundation of the Ministry of Education, China (20060558035), and the Clinical key program of the Ministry of Health, China ([2004] 468).

3.6. Laboratory methods: Cellular biology

P078 EFFECTS OF HYPERBARIC PRESSURE LOADING ON GLUTAMATE NEUROTOXICITY IN PURIFIED RETINAL GANGLION CELLS

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Purpose: To evaluate the effect of hyperbaric pressure on purified retinal ganglion cells (RGCS), and also its additive effect on glutamate-induced neurotoxicity in RGCS using a high pressure incubation chamber.
Methods: RGC cultures were obtained from retina of 6- to 8-day-old rats utilizing the two-step immunopanning procedure. The RGCS were cultured in serum-free medium. After 3-day incubation, the culture medium was changed to b27 neurobasal medium with or without glutamate (5 μm or 25 μm) and the culture was moved to a special incubator in which constant high pressures can be maintained. The RGCS were divided into the following groups: (1) normobaric group, 1.0 ata (atmosphere absolute), (2) hyperbaric group, 15 mmHg + 1.0 ata, (3) hyperbaric group, 30 mmHg +1.0 ata. After 72 hours, using the calcein-AM assay, the percentage of surviving RGCS was determined by comparison with the control group (normobaric group without glutamate). In addition, we also added MK801, an NMDA antagonist, or DNQX, an AMPA/KAINITE antagonist to the RGCS to evaluate its neuroprotective effect on glutamate-induced neurotoxicity in RGCS under pressure.
Results: Without glutamate addition, the viability percentage was 100.4% in the 15 mmHg group and 101.1% in the 30 mmHg group. There was no meaningful difference of cell viabilities between the normobaric group and the hyperbaric groups. With 5 μm glutamate addition, the viability was 100.4% in the normobaric group, 97.2% in the 15 mmHg group and 73.3% in the 30 mmHg group. With 25 μm glutamate addition, the viability was 69.1% in the normobaric group, 55.7% in the 15 mmHg group and 54.5% in the 30 mmHg group. 5 μm glutamate showed no neurotoxicity under normobaric or 15 mmHg conditions, but could induce RGC deaths in 30 mmHg conditions. With addition of 25 μm glutamate, the viabilities of RGCS in both 15 mmHg and 30 mmHg pressure loading groups are lower than that in normobaric group. DNQX showed a stronger protective effect than MK801 in each pressure group (n=10).
Conclusions: In purified RGCS, hyperbaric pressure loading alone could not induce cell death, but exacerbated glutamate-induced neurotoxicity. AMPA/KAINITE receptor may be related to the mechanism of glutamate-induced neurotoxicity in purified RGCS.
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P079 INHIBITORY EFFECT OF A GABA(A) RECEPTOR ANTAGONIST ON RETINAL GANGLION CELL DEATH INDUCED BY OXIDATIVE STRESS

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Purpose: Gaba(a) receptors (gabaars) highly expressed on retinal ganglion cells (RGCS) in retina of glutamate transporter-knockout mice. We investigate to clarify a role of gabaars in RGC death and an effect of gabaar antagonist bicuculline on RGC death induced by glutamate excitotoxicity or oxidative stress.
Methods: RGC-5 cells, an immortalized RGC line, were cultured with gabaar agonist muscimol, glutamate, or H2O2 and cell viability was determined by MTS assay. The changes

of cell viability caused by bicuculline were observed. RGC-5 cells were also immunostained with antibodies against nitrotyrosine, an oxidative stress marker.
Results: RGC-5 cell death was induced by muscimol and it was dose-dependently inhibited by bicuculline. Although glutamate-induced RGC-5 cell death was not affected with bicuculline, bicuculline dose-dependently inhibited RGC-5 cell death caused by H2O2 and also inhibited the expression of nitrotyrosine.
Conclusions: These results suggest that gabaars may play a role in RGC death and bicuculline can function as one of neuroprotective agents against RGC death induced by oxidative stress.
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P080 TGF-BETA2 AND TNF-ALPHA AQUEOUS HUMOR IN ACUTE PRIMARY ANGLE CLOSURE INDONESIAN EYES
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Objective: To measure the level of TGF-beta2 and TNF-alpha in acute primary angle closure Indonesian eyes.
Design: This study was a prospective pre-post test. Patients with acute primary angle closure less than one month and matching cataract patients were included in this study. First aqueous humor was taken through paracenteses on patients, who had been examined, to reduce their intraocular pressure. Then aqueous humor was taken during surgery. If the IOP was not reduced by paracentesis and iridectomy perifer laser, then trabeculectomy was done. While the IOP was normal, phacoemulsification was done. Aqueous humor was taken from the cataract patients during phacoemulsification. TGF-beta2 and TNF-alpha were measured by elisa. Statistics were used to calculate the results.
Results: Forty-five eyes of APAC patients underwent paracentesis, then the IOPs were decreased by 49% despite the amount of perifer anterior sinechia. The TGF-beta2 and TNF-alpha level was high compared to cataract eyes. After the IOP was reduced by paracentesis and IPL, the second TGF-beta2 and TNF2 level was decreased compare to their first level.
Conclusion: If the IOP was reduced, the TGF-beta2 and the TNF-alpha level were also decreased.
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P081 ANTI-PROLIFERATIVE EFFECT OF RETROVIRAL VECTOR-MEDIATED TRANSFER OF SUICIDE GENE ON HUMAN TENON CAPSULE FIBROBLASTS IN VITRO
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Objective: To observe the anti-proliferative effect of HSV-tk/GCV and E.coli.cd/5-FC system on human Tenon capsule fibroblasts (HTFs).

Design: Experimental study.

Methods: To construct a suicide gene transfer system pL(tk)SN and pL(cd)SN by using gene recombination methods. HTFs cells were infected with retrovirus which has been modified with 'tk' and 'cd' gene. RT-PCR was used to detect the MNRA expression of 'cd' and 'tk' gene, western blot to detect the protein expression of 'tk' gene and MTT method to observe the killing effects of HSV-tk/GCV and E.coli.cd/5-FU on HTFs-tk and HTFs-cd cells in various prodrug concentrations. Gap junctional intercellular communication (GJIC) was studied in HTFs-tk and HTFs cells by the scrape-loading lucifer yellow dye transfer method. The 'bystander effect' of both genes was also studied.
Results: Recombinant plasmid pL(tk)SN and pL(cd)SN were correctly constructed, which was confirmed by incision enzyme. The HTFs were successfully infected with tk and cd gene modified retrovirus. The fragments of 'cd' and 'tk' gene were detected by RT-PCR, and 'tk' protein (41kd) was also detected by western blot. The killing effects of HSV-tk/GCV and E.coli.cd/5-FC on HTFs-tk and HTFs-cd cells were dosage-dependent, all cells had died after 5 days when 5 μg/ml GCV and 1500 μg/ml 5-FC had been used; IC50 was 0.6 μg/ml and 400 μg/ml respectively. HTFs-tk and HTFs cells demonstrated strong GJIC. Bystander effects were observed in both kinds of suicide genes. The bystander effect of HSV-tk/GCV was stronger in the higher cell density group than in the lower cell density group.
Conclusions: Retrovirus vector-mediated HSV-tk and E.coli.cd gene transfer system could exert killing effects on HTFs. Cell apoptosis and necrosis could be the pathways of killing effects of the HSV-tk/GCV system on HTFs cells. These effects could be enhanced through bystander effects. One of the mechanisms of the bystander effect of HSV-tk/GCV on HTFs cells may be related to cx43-mediated GJIC.
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3.8. Laboratory methods: Pharmacology

P082 ALPHA-2 AGONIST INDUCED SIGNALLING MECHANISMS AND NEURONAL SURVIVAL

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Purpose: Alpha-2 agonist have different functions in the eye. In the anterior portion they cause a decrease IOP. In the retina and optic nerve alpha-2 agonists can protect against many types of neuronal injury (ocular hypertension, ischema, light toxicity, etc.). The experiments presented here were designed to understand the distribution of alpha-2 receptors in the retina and the role of these receptors in modulating intracellular CA2+ signaling and neuronal protection.
Methods: Retinal sections were prepared from rat eyes. These sections were immunostained with antibodies against alpha-2a, 2b or 2c to map their location. In vitro studies used high speed confocal CA2+ imaging at the ipl of living rat retinal slices. The relative changes of cytosolic free CA2+ were monitored with the fluorescent CA2+ dye fluo-4.
Results: Despite alpha-2a, 2b and 2c receptors being highly homologous they have very different distribution in the retina. Alpha-2a was present within the RGC (retinal ganglion cell) layer. Alpha-2b was more widely distributed while alpha-2c was present in the photoreceptor layer. At the IPL, the CA2+ signal was suppressed in a dose-dependent manner by brimonidine and other alpha-2 receptor agonists. The suppressive action of brimonidine was completely blocked by classic alpha-2 receptor antagonists, such as yohimbine, rauwolscine, and atipamezole.
Conclusions: These findings suggest that a physiological function of the retinal alpha-2 system is the regulation of synaptic transmission at IPL and that brimonidine and other alpha-2 agonists may protect RGCS under disease conditions by preventing abnormal elevation of cytosolic free CA2+ either in RGCS, in their presynaptic cells, or in both.
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P083 DECREASE IN REDUCING POWER OF AQUEOUS HUMOR ORIGINATING FROM GLAUCOMATOUS RABBITS

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Purpose: To evaluate changes in the reducing power of aqueous humor (AH) with cyclic voltemetry (CV) and HPLC-EC.
Methods: NZW albino rabbits exhibiting a sporadic mutation causing bilaterally buphthalmus eyes were set for intra ocular pressure (IOP) and eye size measurements. AH was obtained under deep anesthesia according to ARVO Rules for Animal Care. The study included 6 congenital born glaucomatous rabbits (CGR) and 6 normal rabbits (CON) age-matched. The AH samples were analysed by CV and HPLC-EC.
Results: CGR IOP was found to be significantly higher than in CON (33.5+1.1 mmHg and 14.2+1.0 mmHg respectively), the corneal diameter was 18.25 mm and 13.9 mm respectively.
CV analysis revealed two anodic currents representing two groups of low molecular weight antioxidant (LMWA). The two anodic potentials were equal for the two tested groups,indicating the same components of LMWA.The first anodic current of CGR was only 30% of the CON rabbits (2.11 vs 7.17 MicA/mg protein, t-test: $P<0.05$).As the main hydrophilic components of the first anodic current are known to be uric acid (UA) and ascorbic acid (AA) , they were analysed for exact content by the HPLC-EC method. The levels of UA and AA were significantly lower in the CGR rabbits when compared to CON group.
Conclusion: Changes in the reducing power, as indicated by CV analysis, of CGR AH, is probably a result of chronic oxidative stress caused by the galucoma condition. The differences in the first anodic wave are mainly due to a fall in the concentartion of UA and AA.
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3.11. Laboratory methods: Pharmacogenetics

P084 THE ROLE OF PROSTANOID RECEPTOR (PTGFR) POLYMORPHISM IN THE EXPRESSION OF HLA-DR ON CONJUNCTIVAL EPITHELIAL CELLS IN PATIENTS TREATED WITH TOPICAL LATANOPROST AS ADJUNCTIVE THERAPY

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Purpose: To compare the subclinical inflammation on the conjunctival surface epithelium in patients on topical latanoprost 0.005% as an adjunctive treatment to timolol 0.5% with topical timolol 0.5% as monotherapy and to determine the role of polymorphism of PTGFR in subclinical inflammation of conjunctival surface.
Design: An observational prospective cohort study.
Participants: Fifty-five glaucoma patients; 30 receiving topical latanoprost as adjunctive therapy and 25 on topical timolol as monotherapy.
Methods: POAG, NTG or OHT patients who were on topical timolol was selected. Those who was found to have poor control of glaucoma were started on topical latanoprost as adjunctive therapy (group l) and those with good control were continued with topical timolol (group t). Impression cytology of the conjunctival was taken from both groups at baseline and 3 months of treatment. HLA-DR expression was studied using flow cytometry. We also obtained 3cc of venous blood for PTGFR polymorphism using the DHPLC technique.
Main outcome measures: Increased of subclinical inflammation is defined as 10% increased of HLA-DR expression from baseline and the presence of novel SNP a-> t at flanking region of exon 3 of PTGFR gene.
Results: There was significant increased in HLA-DR expression 3 months after adjunctive therapyin group l (p=0.00) and no significant changes in group t (p=0.14). There was no association between the novel SNP and subclinical inflammation.
Conclusions: Latanoprost as adjunctive therapy to timolol cause increased in subclinical inflammation. However, there was no role of the novel SNP of the PTGFR gene in the variation of sub-clinical inflammation.
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3.12. Laboratory methods: Proteomics

P085 PROTEOMIC ANALYSIS OF AQUEOUS HUMOUR FROM PATIENTS WITH PRIMARY OPEN ANGLE GLAUCOMA

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Purpose: Some aqueous humour (AH) proteins changed in primary open angle glaucoma (POAG) patients, which might play roles in the mechanisms of the disease. To identify the proteins in AH associated with the pathogenesis of POAG, we compared the basic proteomic composition of AH from patients with POAG (patients) with AH from patients with age-related cataract (controls).
Design: Experimental study.
Participants and controls: Five patients and 5 controls were enrolled in the study, who were exempted other ophthalmic diseases, systemic diseases, and intraocular surgery history.
Methods: Approximately 100~200µl AH was collected by a 26 gauge ophthalmic cannula under ophthalmic operation microscope before ocular incision for phacoemulsification surgery or non-penentrate trabecular surgery. Aqueous humour was analyzed for total protein concentration using Bradford's method and for protein composition using two-dimensional gel electrophoresis (2-de). Compared the patients (figure 1) to the controls (figure 2), the spots with darkness changing over 2.0 of ratio in 2-de were selected to the mass spectrometry analysis.
Main outcome measures: Each spot darkness was quantified using the volume percentage of single spot to total spots volume (vol%).
Results: Aqueous humour from patients contained significantly higher total protein concentration than did AH from controls. Nine spots with significant volume percentage ratio changing in the patients' samples were derived from 7 proteins, including cystain c, caspase 14 precursor, albumin precursor, transthyretin, prostaglandin h2 d-isomerase (PGDS), THAP domain containing apoptosis associated protein and tranferrin.
Conclusions: Some up-regulated AH proteins might play important roles in the pathogenesis of POAG by promoting apoptosis of trabecular meshwork cells or amyloid accumulation in the trabecular meshwork.
The study was supported by National Natural Science Foundation grant (30471860 and Scientific Research Common Program of Beijing Municipal Commission of Education km200610025025).
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taglandin d(2) and j(2) induce apoptosis in human leukemia cells via activation of the caspase 3 cascade and production of reactive oxygen species. Biochim Biophys Acta 2005; 1743: 291-304.

P086 PROTEOME ANALYSIS OF TENONS CAPSULE IN FITRATION BLEB AFTER TRABECULECTOMY

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Purpose: Screening of protein organization of filtration bleb after trabeculectomy and investigation of function of proteins in bleb fibrosis.
Design: Case experimental study.
Methods: Samples of Tenon's capsule were collected from patients in bleb-revision as second glaucoma operation and cataract-surgery as negative controls.
Main outcome measures: Samples were lyzed with urea-buffer, and loaded to two-dimensional electrophoresis. Electrophoresis-gels were stained with silver and isolated protein spots were analyzed using pd-quest software (bio rad). Target protein spots, which were highly changed in protein expressions among samples, were selected and proteins were identified by mass-spectrometry (maldi-tof-ms: Burker). Moreover, cellular and protein function of target proteins were analyzed by western blot and RNA knock down assay.
Results: About five hundred protein spots were detected on electrophoresis gel. As changes of protein expressions and their reproducibility, fifteen protein spots were finally selected. Identified proteins include extracellular matrix proteins and intarcellular signaling proteins. Especially, we focus on rsk2 protein, which were highly expressed in Tenon tissue derived from bleb revision operation. Rsk2 sirna induce the cell death on nih3t3 cells, fibroblast cell line, against FGF treatment.
Conclusions: Rks2 protein from tennon tissue after trabeculectomy seems to activate the fibroblast cell line. The inhibitions of rks2 activity may be able to regulate the fibroblast in tennon tissue, and enhance the effect of trabeculectomy.
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P087 ANALYSIS OF ANTIBODY PATTERNS IN GLAUCOMA PATIENTS BY MEANS OF PROTEIN MICRO-ARRAYS

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Purpose: In previous studies changes in the antibody profiles against ocular antigens have been shown in the sera of glaucoma patients and these findings suggest a role for autoimmune involvement in the pathogenesis of glaucoma in some patients. All studies could consistently demonstrate up- and downregulations in immunoreactivities in glaucoma patients compared to controls. However, all these studies have in common that they used crude protein extracts from retina or optic nerve. It was the aim of this study to analyze the immunoreactivities in the sera of glaucoma patients against the most important purified antigens identified in previous studies by customized protein micro-arrays.
Materials and Methods: Sera of patients with primary open angle glaucoma (n=50) and healthy controls (n=50) were used. The protein arrays were prepared by spotting the antigens onto special nitrocellulose-coated slides. Up to 80 different antigens were used in each customized protein micro-array. The arrays were incubated overnight with the sera of patients (1:25) and the antibody-antigen-reactions were visualized by chloronaphthol staining. After digitizing, the spot intensities were compared and analyzed by multivariate statistical techniques.
Results: Using protein micro-arrays, we were able to detect immunoreactivities in the sera of patients and healthy controls against the purified antigens such GFAP, GST, HSP 27, HSP70, HSP60, alpha-fodrin, and α-crystallin. The statistical analysis revealed a significant difference ($p<0.01$) between the antibody reactivities of glaucoma patients and healthy subjects. Furthermore, we could confirm both up- and downregulations in the sera of glaucoma patients compared to healthy subjects as we could demonstrate in our previous studies using antigen mixtures from retina and optic nerve. Based on these antibody reactivities, we were able to detect glaucoma patients with a sensitivity and specificity of approx. 90%.
Conclusions: In this first pilot study, we were able to measure significant changes in the immunoreactivities in the sera of glaucoma patients against purified antigens using protein micro-arrays. The use of purified antigens spotted onto protein micro-arrays might be an important step towards a robust antibody profiling in glaucoma patients suitable to be used in clinical routine.
Supported by DFG (Deutsche Forschungs Gemeinschaft) gr-1463-4-1

3.13.1.1. Laboratory methods: *In vivo* imaging: Laser scanning: Confocal scanning Laser Ophthalmoscopy

P088 OPTIC DISC TOPOGRAPHIC PARAMETERS MEASURED IN THE EXPERIMENTAL GLAUCOMA BY CONFOCAL SCANNING LASER TOMOGRAPHY

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Purpose: To investigate (1) the variability of HRT measurements in normal and experimental glaucoma monkeys, (2) the correlations among HRT parameters, (3) the changes of HRT parameters in experimental glaucoma monkeys, (4) the relationship of HRT parameters to optic nerve fiber number in experimental glaucoma monkeys.

Methods: Four normal monkeys and 16 laser-induced glaucoma monkeys were studied. Optic disc topography was measured in vivo with HRT three times. Coefficient of variance of each parameter was obtained from three measurements. Correlations among the topographic parameters were analyzed. The difference of each parameter between normal and experimental glaucoma monkeys was analyzed. Finally 4 normal and 8 experimental glaucoma monkeys were sacrificed. The nerve fiber number of each optic nerve cross section was estimated. The relationship between the nerve fiber count and each HRT parameter measured before sacrifice were calculated.
Results: The coefficients of variation for rim area, mean cup depth and maximum cup depth were less than 10% both in normal and glaucomatous monkeys. The rim area (CV: 6.9% in normal and 4.7% in glaucoma) was the most reproducible parameter. The correlations among the topographic parameters (cup area, cup/disk ratio, cup volume, mean cup depth and maximum cup depth) in normal and experimental glaucomatous monkeys were strong, which was similar to human. The difference of all HRT parameters between normal and glaucomatous monkeys was distinguished except disk area. Rim area and cup/disk ratio were the most sensitive parameters. Cup/disk ratio, rim area, cup volume, disk volume, mean cup depth, maximum cup depth and cup shape measure correlate significantly to the optic nerve fiber number. Rim area (r=0.814), cup shape measure (r=-0.886) and cup/disk ratio (r=-0.833) showed strong correlation with the optic nerve fiber number.
Conclusions: Rim area is a reproducible and useful parameter in experimental glaucomatous monkeys. The changes of optic nerve head in experimental glaucoma monkeys are similar to that of glaucoma patients. HRT could be used to evaluate optic nerve damage in glaucoma, and rim area is the best parameter.

3.13.1.2. Laboratory methods: In vivo imaging: Laser scanning: Confocal scanning laser polarimetry

P089 SPATIAL AND TEMPORAL ASSOCIATION BETWEEN NEURORETINAL RIM LOSS AND RETINAL NERVE FIBRE LAYER THICKNESS MEASUREMENTS IN PATIENTS WITH OPTIC DISC HAEMORRHAGES

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Purpose: Since ODH represent an acute event associated with well defined localized changes of the NRR and RNLF, the purpose of this study was to investigate the ability of scanning laser polarimetry (SLP) to detect thinning of the RNLF after occurrence of ODH. Spatial and temporal association between RNLF and NRR loss have been evaluated.
Design: Cohort study.
Participants: Seventeen eyes of 15 patients with ODH.
Method: All patients underwent annually complete standardized ophthalmologic examination including slit lamp biomicroscopy, ophthalmoscopy, gonioscopy, 24-h IOP measurement, standard static white on white perimetry as well as SLP and optic disc photographs. Patients had a minimum follow-up of at least 3 consecutive annual visits after the occurrence of ODH and at least one examination before. Average follow-up was 5.0 ± 1.4 years. ODH was defined as haemorrhage observed either on the optic disc or the parapapillary retina extending to the NRR. Evaluation of ODH was performed using 15° stereographic slides of the optic disc. Locations of haemorrhage were defined according to the optic disc sectioning described by Jonas. Exclusion criteria were all eye diseases other than glaucoma, and all secondary causes of haemorrhage such as ischemic optic nerve neuropathy, papillitis, retinal vein occlusion, diabetic retinopathy, and posterior vitreous detachment.
Main outcome measures: NRR change (planimetry): global measurements and sector analysis. RNLF change (SLP): standard GDX variables and sector analysis. Statistical analysis: non-parametric tests have been used (Wilcoxon test, Friedmann test, Spearman correlation coefficient) as appropriate (SPSS for windows, version 14.0; SPSS, Chicago, IL, USA).
Results: From all investigated parameters the number had the highest diagnostic power to detect progressive change after occurrence of ODH. Higher values were observed already at the time point at which the haemorrhage occurred but differences were statistically significant not before follow-up of 2 years or more (38.12 ± 27.9 vs 43.76 ± 29.1, p=0.02). RNLF thickness decreased in the affected sector and differences were significant after 3 years follow-up (p=0.04). NRR area globally and in the affected sector decreased (1.09 ± 0.39 vs 1.02 ± 0.37 mm2, p<0.01 and 0.29 ± 0.11 vs 0.26 ± 0.10 mm2, p<0.01) and parapapillary chorioretinal atrophy (0.34 ± 0.35 mm^2 vs 0.53 ± 0.43 mm2, p<0.01) increased during the follow-up period. Correlation coefficient between nerve fibre and NRR loss over time was r=0.46, p=0.08.
Conclusion: SLP might detect progressive morphologic glaucomatous changes following ODH. Long-term follow-up as well as repeated measurements are necessary to detect localized RNLF changes after ODH.
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P090

3.13.3. Laboratory methods: *In vivo* imaging: RGC imaging

P091 LONGITUDINAL IN VIVO IMAGING OF RETINAL GANGLION CELLS DEGENERATION AFTER OPTIC NERVE CRUSH IN A TRANSGENIC MICE MODEL

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Purpose: Expression of thy-1 by retinal ganglion cells (RGCS) is down-regulated following optic nerve crush and prior to RGC death. The present study investigated whether fluorescence loss in RGCS of transgenic mice expressing cyan fluorescent protein under control of the thy-1 promoter (thy1-CFP mice) could be followed in vivo using a modified confocal scanning laser ophthalmoscope.
Design: Longitudinal study.

Methods: Six thy1-CFP mice aged 3-6 months were imaged with a blue-light confocal scanning laser ophthalmoscope (BCSLO, modified Heidelberg Engineering HRA1 with 460 nm excitation and 490 nm detection) before and weekly for 3 weeks after optic nerve crush in one randomly selected eye. Sham procedure was performed in the opposite eye. The mice were held steady by an assistant during the imaging and no anesthesia was required.
Main outcome measures: Corresponding retinal areas before and after optic nerve crush were compared and the fluorescent ganglion cell layer neurons were counted manually.
Results: Fluorescent points corresponding to CFP-expressing ganglion cell layer neurons were discernable with the BCSLO (figure 1a). A consistent and progressive loss of fluorescent points was found after optic nerve crush (figure 1b-d) with 34.6±8.9%, 16.0±4.2% and 11.6±6.0% of the fluorescent cells remaining 1, 2, and 3 weeks after the crush, respectively (n=6). No change in the fluorescent cell density was found in the opposite eyes in which the sham procedures were performed.
Conclusions: The present results demonstrate that the BCSLO can readily image fluorescent ganglion cell layer neurons and provide a non-invasive approach to monitor the progressive loss of CFP expression in RGCS of transgenic thy1-CFP mice. The imaging of thy-1 promoter-driven CFP expression in these mice could serve as a sensitive indicator of the functional integrity of RGCS and offer a new model to study RGC degeneration in glaucoma and to study the effect of neuroprotective agents.
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3.13.4. Laboratory methods: *In vivo* imaging: Other

P092

5. EXPERIMENTAL GLAUCOMA; ANIMAL MODELS

P093 ASSOCIATION OF PI3K/AKT AND JAK/STAT PATHWAYS AND MACROPHAGES IN RETINAL GANGLION CELL VIABILITY AFTER ACUTE ELEVATION OF INTRAOCULAR PRESSURE

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Purpose: To investigate the roles of PI3/Akt and JAK/STAT pathways in retinal ganglion cells (RGC) survival after acute intraocular pressure (IOP) elevation.
Design: Experimental study.
Participants: Sprague Dawley rats (200-250g).
Methods: Two inhibitors for each pathway were used. Intravitreal injections of each inhibitor into the left eye were performed 3, 9, and 15 days after 2-hour IOP elevation at 110 mmHg. Forty hours before animal sacrifice, fluorogold was applied to newly cut optic nerve (ON) stump to retrogradely label surviving RGCS. The effects of IOP elevation on the pathway activities and their locations in the retinas were examined by western blotting and immunohistochemistry, respectively. Clodronate liposomes were used in the eye and intravenously to remove phagocytic cells and to examine the role of the inhibitors independent of macrophage/microglia in vivo. Retinal explant experiments were carried out to examine the effect of these inhibitors on RGC viability in vitro.
Results: Sham IOP elevation procedure did not of itself affect RGC viability. Acute IOP elevation activated both pathways in the retina, and pathway activities were located in the ganglion cell layer (GCL), and resulted in a gradual loss of RGCS (27% by 2 weeks and 40% by 3 weeks after IOP elevation). Inhibition of these pathways resulted in macrophage invasion into the eye and decreased RGC viability. Removal of macrophages in the eye or by systematic application using clodronate liposomes reduced the inhibitors-induced RGC death. Similar observations were also obtained in retinal explants.
Conclusions: Our data demonstrate that 1) acute IOP elevation activates PI3k/Akt and JAK/STAT pathways in gcl, 2) PI3k/Akt and JAK/STAT pathways mediate RGC survival following acute IOP elevation, and 3) inhibition of these pathways activates macrophages in the eye and pathway inhibition-dependent macrophage activation is detrimental to RGCS.
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5.1. Experimental glaucoma; animal models: Rodents

P094 IMAGING RETINAL GANGLION CELLS AND THEIR LOSS IN THE LIVING MOUSE

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Purpose: To visualize retinal ganglion cells (RGCS) and their gradual loss in the living mouse.
Design: Experimental study.
Methods: We used b6.cg-tg(thy1-cfp)23jrs/j mice which express cyan fluorescent protein in RGCS. We used a commercially available mydriatic retinal camera attached with a 5-million pixel digital camera to visualize RGCS in vivo. We recorded fundus photographs longitudinally in the ischemia reperfusion model group, the optic nerve crush model group, and the untreated group to evaluate the longitudinal changes in the number of RGCS in experimental models.
Main outcome measures: To detect the continuing loss of RGCS at the single-cell level in vivo.
Results: We have devised an in vivo imaging technique using a conventional retinal camera and have visualized RGCS at the single-cell level. In the ischemia reperfusion model and the optic nerve crush model, a longitudinal reduction in the number of RGCS was demonstrated in each mouse eye. Age-related loss of RGCS was also demonstrated in untreated normal eyes.
Conclusions: This in vivo technique allows non-invasive, repeated and longitudinal evaluation of RGCS for investigation of retinal neurodegenerative diseases and new therapeutic modalities for them.

P095 IOP-LOWERING EFFECT OF A RHO-ASSOCIATED COILED-COIL-FORMING KINASE INHIBITOR IN MOUSE EYE

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Purpose: Rho-associated coiled-coil-forming kinase (ROCK) inhibitors are reported to decrease intraocular pressure (IOP) in rabbit eyes and supposed to regulate IOP in monkey and human eyes through relaxation of trabecular meshwork and ciliary muscle. In this study, IOP-lowering effect of a ROCK inhibitor and its synergistic effect with latanoprost are investigated using mouse eyes.

Methods: A ROCK inhibitor (k115) was prepared as 0.5% solution. C57bl/6j mice were acclimatized under the 12-hour light-dark cycle (6:00 on 18:00 off) for at least 2 weeks before experiments. Three microliters of the solution was topically applied once into one of two eyes in a blind manner at 18:00. The fellow eyes were untreated. IOP was measured by a microneedle method. At 0.5, 1, 2, and 4 hours after the administration, the IOP-lowering effect was calculated as the difference between IOP in the treated eye and that in the contralateral untreated eye. (n=5-6 for each time point) 0.125, 0.25, and 0.5% k115 were used to examine dose-dependent response in IOP reduction. (n=7-10 for each dose) next, the additional iop-lowering effect of k115 to latanoprost was examined. 0.25% k115 was applied 2 hours after the administration of 0.005% latanoprost, then further 30 minutes later IOP was measured. (k115/latanoprost group) as a control group, IOP was measured 2.5 hours after the administration of 0.005% latanoprost without k115. (latanoprost group) the IOP reductions in the two groups were compared. (n=6 for each group)
Results: 0.5% k115 solution showed maximum IOP reduction by 29.6±4.3% in 30 minutes after the administration. 0.125, 0.25, and 0.5% k115 revealed significant IOP reduction ($p<0.01$) in a dose-dependent manner by 17.9±6.7%, 22.1±2.7% and 30.5±3.7%, respectively. IOP reduction in k115/latanoprost group (37.3±6.4%) was significantly higher than that in latanoprost group (24.8±4.1%) ($p<0.01$)
Conclusions: A ROCK inhibitor (k115) significantly reduced mouse IOP and also showed a significant additive effect on latanoprost-induced IOP reduction. K115 may have a therapeutic potential for glaucoma.

P096 THE NATURAL HISTORY OF RETINAL GANGLION CELL DYSFUNCTION AND ITS RELATIONSHIP WITH IOP IN DBA2/J MICE

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Purpose: To characterize the natural history of retinal ganglion cell (RGC) dysfunction, as measured by pattern electroretinogram (PERG) and its relationship with IOP in glaucomatous DBA/2j mice.
Methods: IOP and PERG were longitudinally recorded (one month steps) in anesthetized (Ketamine/ Xylazine) DBA 2/j mice (n=32, 64 eyes). IOP was measured with a rebound tonometer (Tonolab, Colonial Medical Supply). PERG was recorded in response to high contrast (95%) alternating (1 hz) gratings (0.05 cycles/deg, 50 x 56 deg field size). Diffuse light flashes on an adapting background (FERG) were also recorded as an index of outer retina activity. After the follow up period, eyes were histologically processed to evaluate the thickness of the retinal nerve fiber layer (RNLF).
Results: IOP increased moderately between 2 and 6 months with a progression of 0.92 mmHg/month. After 6 months the IOP displayed a steeper increase and tended to level off by 11 months. The PERG amplitude decreased progressively after 2 months of age to reach the noise level (85% amplitude loss) at about 10-11 months, at which age histological analysis showed a relatively minor loss of retinal nerve fiber layer (RNLF) thickness (-39±18%). IOP and PERG changes with time were highly correlated ($p<0.001$). Between 2 and 11 months the cone-flash erg did not show significant changes.
Conclusions: In DBA/2j mice inner retina function progressively decreases after 2 months of age and it is virtually abolished by 10-11 months, while outer retina function is unchanged. In keeping with previous optic nerve histology (Libby et al, Vis Neurosci 2005), at 10-11 months the RNLF thickness is relatively spared, thereby indicating that RGC dysfunction may precede RGC death. Progression of inner retina dysfunction is strongly associated with progressive IOP increase.

P097 POSTURAL CHANGES OF IOP AND PATTERN ERG IN DBA/2J MICE

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Purpose: Head-down position causes a substantial IOP increase in mice (Aihara et al., Curr Eye Res 2003). Our purpose is to characterize the effect of postural IOP changes on retinal ganglion cell function in the DBA/2j mouse model of glaucoma.
Methods: Three groups of DBA/2j mice (3 month old, n=7; 5 month old, n=7, 10 month old, n=7) were studied. Mice were anesthetized with 0.6 ml/kg of a mixture of Ketamine (42.8 mg/ml), Xylazine (8.5 mg/ml) and acepromazine (1.4 mg/ml) delivered i.p. IOP and the pattern electroretinogram (PERG) were sequentially measured at 0°, 60° head-down position, and 0°. IOP was measured with a tonolab' rebound tonometer (Wan-Heng Wang et al., IOVS 2005). The PERG was recorded in response to high-contrast (95%), large-field (50 x 56 deg) horizontal gratings (0.05 cycles/deg spatial frequency) alternating at 1 hz. All procedures were performed in compliance with the ARVO statement for use of animals in ophthalmic and vision research.
Results: On average, 60º head-down induced significant, reversible IOP increases in all age groups (3 months: 13.3±0.4 to 17.8±1.1 mmHg; 5 months: 14.6±1.2 to 20.0±1.8 mmHg; 10 months: 20.0±1.3 to 26.2±1.3 mmHg). Head-down position induced reductions of PERG amplitude in older (glaucomatous) mice but not in young (pre-glaucomatous) mice (3 months: 10.8±1.3 to 10.8 ±0.9 µv; 5 months: 8.7±0.9 to 4.5±0.5 µv; 10 months: 4.5±0.5 to 1.467±0.2 µv). IOP and PERG changes were negatively correlated ($p<0.001$) in 10 month old mice.
Conclusions: Head-down (60º) position induces reversible IOP changes in DBA/2j mice. The impact of IOP elevation on RGC function is age-dependent. The amount of PERG reduction is more pronounced in older mice, in which the severity of disease is more advanced (Libby et al., Vis Neurosci 2005). The combined evaluation of postural changes of IOP and PERG may represent a powerful, non invasive tool to evaluate IOP-dependent retinal ganglion cell vulnerability in mouse models of glaucoma.

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5.2. Experimental glaucoma; animal models: Primates

P099 ASTROCYTE PROLIFERATION AND GDNF UP-REGULATION IN THE LATERAL GENICULATE NUCLEUS OF EXPERIMENTAL PRIMATE GLAUCOMA

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Purpose: To investigate the changes of astrocyte reactivity and glial cell line-derived neurotrophic factor (GDNF) expression in the lateral geniculate nucleus (LGN) following experimental primate glaucoma.
Methods: Five rhesus monkeys with monocular experimental glaucoma and four control monkeys were studied. Brain sections containing the LGN were examined following immunocytochemical staining with antibody to GFAP, s-100 and GDNF. Double immunolabelling of GDNF with GFAP and parvalbumin respectively were also studied in the LGN by confocal microscopy. Optic nerve fiber count was determined by light microscopy.
Results: In the normal LGN, a few GFAP, s-100 and GDNF expression were observed across layer 1 to 6. GFAP and s-100 positive glial cells were significantly increased in layers connected to the glaucomatous eye compared with those connected to the non-glaucomatous eye. Moreover, GFAP and s-100 expression were increased in layers connected to the non-glaucomatous eyes compared to the corresponding layers in control group, which is more evident in severe glaucoma with 100% optic nerve fiber loss (image 1,2). Expression of GDNF protein was also increased in layers connected to the glaucomatous eye. Double immunostaining showed that the GDNF expression was mainly of glial origin.
Conclusions: Experimental glaucoma induces astrocytes proliferation and GDNF up-regulation in the lateral geniculate nucleus. The findings may be relevant to understanding the role played by glial cells in the central visual system of glaucoma.
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5.3. Experimental glaucoma; animal models: Other

P100 TISSUE BIOENGINEERING FOR BLEB DEFECTS: AN ANIMAL STUDY

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Objective: Evaluation of IOP distribution in Egyptians above the age of forty.
Design: Cross-sectional study.
Participants: Individuals above the age of forty who entered the ophthalmic clinics of ten of the members of the Egyptian Society for the Glaucomas (ESG) for any complaint not related to glaucoma or elevated IOP.
Methods: IOP was measured in both eyes using the standard Goldmann applanation tonometer.

Main outcome measures: 1,841 eyes belonging to 932 individuals. The IOP ranged from 8 to 59 mmHg with a mean of 16.2 ± 4.6 mmHg.
Results: Data were corrected by excluding IOP 2 SDs away from the mean. After correction, 1796 eyes belonging to 915 individuals were included of which 465 were males and 437 females, while the gender was not specified in 13 individuals. The mean IOP was 15.7 ± 3.3 mmHg. Table 1 shows the results of the data. Figure 1 shows the IOP distribution curve which is slightly skewed to the right as found in other studies. Considering the upper limit of normal IOP as the mean + 2 SD 1, ocular hypertension should be considered in 55 eyes (3%) where IOP is > 22 mmHg. This coincides with IOP > 97.5th percentile (table 2). The mean IOP in males (15.3 ± 3.3 mmHg) was significantly (P = 0.0003) lower than IOP in females (15.9 ± 3.3 mmHg) (figure 2). There was only a significant difference between the mean IOP in the age group from 61 to 70 years and both the mean IOP in all individuals above the age of forty and the mean IOP in age group from 51 to 60 years (Table 3).
Conclusions: The mean IOP in Egyptians above the age of forty is 15.7 mmHg and ocular hypertension and glaucoma suspect should be considered when IOP is > 22 mmHg which satisfies both definitions of 2SD above the mean1 and > 97.5th percentile(3). Glaucoma should be considered when IOP is more than 26 mmHg which coincides with the 99.5th percentile. The mean IOP was 15.4 mmHg in males and 15.9 mmHg in females and increased to 16.1 mmHg in the 61-70 years age group. This sex and age difference is not consistent with other studies in different populations.
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6. CLINICAL EXAMINATION METHODS

6.1. Clinical examination methods: Intraocular pressure measurement; factors affecting IOP

P101 THE IOP DIURNAL FLUCTUATIONS IN PATIENTS WITH PSEUDOEXFOLIATIVE SYNDROME

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Purpose: To analyze the IOP diurnal fluctuations in patients presenting pseudoexfoliative syndrome (PEX) compared to those without PEX.
Design: A clinical observational prospective study, one year.
Participants and controls: Two groups of patients: group a (13 patients) with pseudoexfoliative syndrome (PEX) and group b, control, (11 patients) ' without PEX. The groups were homogeneous about the age and sex distribution.
Methods: At each visit 4 IOP measurements were taken using Goldmann aplanotonometry.
Main outcome measures: 58% of PEX patients the IOP had greater than 6 mmHg diurnal fluctuations during the study period. In the control group, only one patient had the same fluctuations.
Results: By comparing the two groups have been observed significant differences about the maximum IOP, the mean IOP and the diurnal fluctuations, also about the incidence of the complications.
Conclusions: The IOP diurnal fluctuations in PEX patients are significantly greater than the physiological ones and therefore influence the therapeutic attitude and the prognostic. The significant fluctuations in the IOP diurnal curve are an important predictive factor for the eyes that will develop secondary glaucoma. The pseudoexfoliative syndrome is an independent risk factor for glaucoma in patients with intraocular hypertension.
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P102 RELATIONSHIP BETWEEN OCULAR PULSE AMPLITUDE EXAMINED BY DYNAMIC CONTOUR TONOMETER AND INTRAOCULAR PRESSURE OR CENTRAL CORNEAL THICKNESS

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Purpose: Ocular pulse amplitude (OPA) has been shown to have a significant correlation with intraocular pressure (IOP) and a negative correlation with axial length (AL). OPA has also been thought to rely on the elastic properties of the ocular shell. This study was conducted to evaluate the differences between primary open angle glaucoma (POAG) and primary angle closure glaucoma (PACG) in the correlation between OPA and IOP (exp-1) or central corneal thickness (CCT) (exp-2) using a dynamic contour tonometer (DCT).

Design: Cross-sectional survey.
Participants: In total, 318 eyes of 186 glaucoma patients (pts) (217 eyes / 130 pts, POAG; 101 eyes / 56 pts, PACG (mean age: 63.9±12.5 years) at the glaucoma clinic in Kyoto Prefectural University of Medicine.
Methods: In exp-1, single regression analysis was performed and compared between the POAG and PACG groups in the condition of IOP as x-axis and OPA as y-axis. Seventeen patients from exp-1 were selected for exp-2, all patients matching the following inclusion criteria: both eyes were examined and received the same kind of eye drops, AL of each eye were matched within 0.6 mm, OPA had a difference of more than 0.5 mmHg between the right and left eyes.
Main outcome measures: Associations between OPA and IOP in the two groups. In exp-2, mean IOP and CCT were cal-|culated and compared between those eyes of higher OPA (OPAH) and lower OPA (OPAL) using the student's t test.
Results: There was a positive correlation between OPA and IOP in both groups (0.10 mmHg OPA / mmHg IOP, r=0.44, p<0.01 (POAG) and 0.16 / mmHg IOP, r=0.52, p<0.01 (PACG)), and the slope of PACG was significantly higher than that of POAG (p=0.028). Not only mean IOP, but also mean CCT of OPAH showed no significant differences (p = 0.81 for IOP, 0.84 for CCT) from those of OPAL (OPAH: 18.4±3.1, OPAL: 18.1±3.4 mmHg for IOP, OPAH: 531±45.4, OPAL: 534±51.1 micrometer for CCT) among those eyes with matched AL.
Conclusions: The OPA readings in both POAG and PACG examined by DCT showed a significant positive correlation with IOP, while a different trend was observed between the two types. CCT showed little contribution to the OPA differences between the two eyes with matched AL.
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P103 OCULAR PULSE AMPLITUDE WITH NORMAL TENSION GLAUCOMA IN JAPAN

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Purpose: To investigate factors to affect ocular pulse amplitude (OPA) with NTG, using dynamic observing tonometry (DOT; Ophthalmic Development Co). Knowing the OPA in NTG may be useful for the elucidation of pathology in NTG.
Design: Cross-sectional, case controlled study.
Participants and controls: 60 NTG patients (mean 61.3±13.5 y.o.) and 64 age matched healthy control (mean 54.7±17.2 y.o.) were enrolled in this study. NTG; refractive error (mean2.3±3.03d). MD of Humphrey Field Analyzer (HFA) 30-2 (mean7.6±7.01db). Control; refractive error (mean1.01±2.7d).
Methods: DOT was used to measure base line pressure (PO; dialated ocular pressure) and OPA in all participants by same examiner. Visual fields were measured by Humphrey Field Analyzer (Zeiss, Dublin, CA).
Main outcome measures: The followings were analyzed in NTG and control groups. I) comparison of OPA (student's t-test). II) the correlation between OPA and following parameters (age, refractive error, applanation IOP, systolic blood pressure, diastolic blood pressure, average blood pressure, pulse pressure, ocular perfusion pressure, PO, MD of HFA 30-2) (Pearson's correlation coefficient). III) the exploration of determinants to OPA (multiple regression analysis).
Results: I) OPA in NTG (1.8±0.5mmHg), OPA in control (2.2±0.7mmHg) (p<0.05). II) in NTG, PO (r=0.34, p=0.005) and pulse pressure (r=0.34, p=0.0063 were significantly associated with OPA. In control, pulse pressure (r=0.46, p<0.0001), PO (r=0.41, p=0.005) and refraction (r=0.294, p=0.013) were associated with OPA. Iii) po (p=0.0165) and pulse pressure (p=0.0197) influenced OPA in NTG. Pulse pressure (p=0.0137), PO (p=0.002), and refractive error (p=0.0009) influenced OPA in controls (NTG; r2=0.19, control; r2=0.39).
Conclusions: The OPA in NTG was significantly reduced (p<0.01) compared with control. Thus, measuring OPA may be useful in differential diagnosis of NTG. The correlation between OPA and pulse pressure was lower than control. Therefore, these results suggest that vascular deficiency may concern with the pathology of NTG.
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P104 HEAD-DOWN YOGA POSTURES AND INTRAOCULAR PRESSURE PROFILES

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Objective: To analyse the intraocular profiles in head-down postures practised in yoga exercises.
Design: Prospective case observational series.
Participants: Trained yoga practitioners in an institutional set up.
Methods: Sirsasana (1. Head-stand-n=74), Sarwangasana (2. Shoulder-stand-n=26) and Janu Sirsasana (3. Head to knee posture-n=12) were performed as per institutional protocol. Tonopen was used to measure the IOP before, during (0 and 2/5 minutes) and after the postures. Right eye data was compared using paired t-test for between groups and repeated measures anova for within groups' analysis.
Main outcome measures: Intraocular pressure within and between groups at various intervals.

Results: Baseline IOP between three postures was not significant (1. 14 ± 2.9; 2. 15.7 ± 3.9; 3. 14.8 ± 3 mmHg). The three different postures showed significant raise in IOP with the postures with head-stand showing the maximum raise in IOP (29.3 ± 4.3 mmHg - 2 times) followed by shoulder-stand (23.3 ± 3.5 mmHg - 1.5 times) and then by head to knee posture (20.7 ± 3.2 mmHg - 1.25 times); p<0.00. Between groups analysis showed significant differences in maximum IOP attained during the posture (p<0.0).
Conclusion: All three head-down postures raise the IOP while head-stand and shoulder-stand raise the IOP beyond physiological limits and can be avoided in glaucoma patients. There is a need to study the long-term effects of yoga postures and the ocular health.
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P105 COMPARISON BETWEEN GOLDMANN APLANATION TONOMETRY, PASCAL TONOMETRY AND TONOMETRY CORNEA COMPESATED BY OCULAR RESPONSE ANALYZER (ORA)
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Objective: To evaluate the concordance level and the reproducibility in the intraocular pressure (IOP) obtained through Goldmann's applanation tonometer (GAT), the Pascal tonometer (PT) and the ocular response analyzer (ORA).
Design: Transversal study, diagnostic technology evaluation.
Group study: One hundred fifty-seven eyes of 80 patients. The IOP was measured by 2 evaluators in the following order: PT, GAT and ORA. The first eye was ramdomized for each evaluator, and all measures was taken the same day for all methods was a blind study.
Main outcome measures: IOP was measured by GAT, PT and ORA.
Results: The GAT, ORACC and PT have good correlation and between the two observers. PT over estimate GAT in 1 mmHg aprox. and ORACC over estimate AGT in 4 mmHg approx.
Conclusions: The tag is still a simple, accesible, useful and reproducible method to measure IOP. Still there are anatomical factors and/or functional different from the cornea that may or may not affect the IOP.
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P106 OCULAR PULSE AMPLITUDE IS ASSOCIATED WITH SYSTEMIC VASCULAR DYSREGULATION
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Purpose: Ocular pulse amplitude (OPA) may reflect the ocular hemodynamic status. We investigated the association of OPA measured by dynamic contour tonometer (DCT; Pascal) with systemic condition that might affect ocular blood flow.
Design: Cross-sectional study.
Participants: Two hundred and seven glaucoma suspects referred to a tertiary care glaucoma clinic were included.
Methods: Each patient had Humphrey visual field 24-2 full threshold examination, OPA measurements by DCT, and completed a systematic questionnaire on systemic condition and previous medical history (i.e., hypertension, diabetes mellitus, ischemic heart disease (IHD), cerebral infarct, dyslipidemia, migraine, and Raynaud's phenomenon) that might compromise ocular hemodynamics. Eyes with intraocular pressure (IOP) ≥ 22 mmHg were excluded from the analysis. The OPA was compared between the patients with and without glaucomatous VFD, and also compared between the patients with and without specific systemic condition or previous medical history on the questionnaire. We also investigated the association of OPA with visual field indices.
Main outcome measures: Ocular pulse amplitude measured by DCT.
Results: Sixty-one subjects were diagnosed as having glaucomatous VFD. There was no significant difference of OPA between the patients with and without glaucomatous VFD. Subjects who had a previous history of IHD (p value = 0.041) and Raynaud's phenomenon (p value = 0.001) showed significantly higher OPA values than ones who did not. There was no significant difference of OPA based on the other items on the questionnaire. OPA was not correlated with visual field indices.
Conclusions: OPA was increased in subjects with IHD or Raynaud's phenomenon. These findings suggest that OPA may be associated with autonomic dysregulation of the ocular blood flow.

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P107 RELATIONSHIP OF IOP MEASUREMENTS BY DYNAMIC CONTOUR TONOMETRY AND GOLDMANN APPLANATION TONOMETRY WITH FUNCTIONAL AND STRUCTURAL GLAUCOMATOUS DAMAGE IN THE EYES WITH OPEN-ANGLE GLAUCOMA

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Purpose: To investigate the relationship between intraocular pressure (IOP) measurements by dynamic contour tonometry (DCT) and by Goldmann applanation tonometry (GAT) and functional and structural glaucomatous damage.
Design: Cross-sectional study.
Participants: One hundred seventy-two glaucoma suspected eyes with open angle were evaluated at their initial examination.
Methods: IOP was measured by DCT and by GAT for each eye. Visual field was evaluated on the Humphrey field analyzer (HFA). Retinal nerve fiber layer (RNLF) was evaluated with scanning laser polarimetry with variable corneal compensation (SLP-VCC) and optical coherence tomography (OCT). Linear regression analysis was performed between IOP measurements by DCT or GAT and functional and structural glaucomatous damage assessed by HVFA, SLP-VCC and OCT. We also compared the absolute values of residuals in each regression model to find out the difference between the association of IOP measured by each tonometer with glaucomatous damage.
Main outcome measures: IOP was measured by DCT and by GAT.
Results: Five out of 10 regression models showed statistical significance for both DCT and GAT. IOP measurements by dct were significantly associated with mean deviation (MD), pattern standard deviation (PSD) among HVF indices, with inferior average among SLP-VCC parameters, and with inferior average, average thickness among OCT parameters ($p<0.05$). IOP measurements by GAT were significantly associated with MD, PSD, and CPSD among HVF indices, and with inferior average, average thickness among oct parameters ($p<0.05$). There was no significant difference in the association of IOP measured by each tonometer with glaucomatous damage between each tonometer.
Conclusions: IOP measurements by DCT showed as similar degree of association with glaucomatous damage as that by GAT. DCT seems to be as effective as GAT in revealing the pressure-dependent glaucomatous damage.

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6.1.1. Clinical examination methods: Intraocular pressure measurement; factors affecting IOP: Devices, techniques

P108 NON-INVASIVE MEASUREMENT OF INTRAOCULAR PRESSURE BY NEAR INFRARED SPECTROSCOPY

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Purpose: To assess a new non-contact method for non-invasive measurement of intraocular pressure (IOP) using near infrared spectroscopy.
Design: Experimental study.
Methods: Eleven porcine eyes were cannulated into the anterior chamber by a needle connected with a water column. Measuring the near infrared spectrum in diffuse reflectance out of the anterior chamber by near infrared spectroscopy, IOP was determined and compared with the height of the water column which was varied between 0 cm and 100 cm.
Results: In total 363 near infrared spectrometric measurement values were obtained. Correlating the near infrared spectrometric measurements with the height of the water column showed a relationship with a correlation coefficient of r2=0.858 and a steepness of the regression line of 0.96.
Conclusions: The results of the present pilot study suggest that near infrared spectrometric tonometry may present a new technology for non-invasive and non-contact intraocular pressure measurement.

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P109 COMPARISON OF TONO-PEN AND PERKINS TONOMETERS IN THE MEASUREMENT OF INTRAOCULAR PRESSURE IN CHILDREN UNDERGOING PEDIATRIC CATARACT SURGERY.

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Objective: 1.To estimate the agreement in measurements of intraocular pressure (IOP), obtained by the tono-pen and Perkins tonometers in children. 2.To measure the central corneal thickness (CCT) and to correlate this measurement with ocular biometric data and other variables.
Design: Prospective, comparative case series.
Participants: One hundred four consecutive children who underwent surgery for congenital cataract between April 2006 and January 2007.
Method: Baseline data were collected for children undergoing surgery for congenital cataract that will be followed up for a minimum of 5 years to assess the incidence and risk factors of glaucoma in these eyes. Measurements were obtained under general anesthesia after intubation. Children with traumatic, steroid induced, complicated cataracts; those with preexisting glaucoma defined as IOP>25 mmHg associated with disc changes and those undergoing additional surgical procedures were excluded.
Main outcome measures: 1. Agreement between the measurements obtained with the two instruments. 2.Correlation of CCT with IOP measured with the Perkins tonometer and other variables.
Results: Mean difference between the Tono-pen IOP and Perkins tonometer was 4.49 mmHg for the right eyes (95%c.i:3.66 to 5.32). The intraclass correlation coefficient was 0.42 (95%c.i:-0.41-0.691). Pearsons correlation coefficient was 0.637 (p=0.001). Results were similar in the left eyes the Tono-pen significantly overestimated the IOP in the entire range of IOPs obtained. CCT did not correlate with IOP measured with the Perkins tonometer (p=0.3), axial length (p=0.07), horizontal corneal diameter (p=0.45), corneal curvature (p=0.863), age (p=0.82) or gender (p=1).
Conclusions: Measurement with the Tono-pen consistently overestimated intraocular pressure in these children. Measurements of CCT did not correlate with IOP, ocular biometric measurements and other variables.
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P110 EVALUATION OF THE ELECTRONIC TONOMETERS PASCAL, OCUTON A, ICARE AND TGDC-01: IS THE INTERNATIONAL STANDARD FOR TONOMETERS, ISO NORM 8612, AN ADEQUATE TOOL?

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Purpose: We evaluated four modern electronic tonometers (Ocuton a, Pascal dynamic contour tonometer (DCT), Icare rebound tonometer, transpalpebrale TGDC-01 PRA tonometer) according to the international standard for tonometers iso 8612.
Design: Non-randomized clinical trial.
Participants: Eight hundred sixty-three eyes of 471 patients without corneal pathology were examined.
Methods: The requirements for ocular tonometers are standardized in the international standard iso 8612, which is used to certify tonometers for clinical use. The certification requires comparative measurements between the test and the Goldmann applanation tonometer (GAT) as reference tonometer on at least 150 eyes. The mean value and standard deviation were calculated for each set of measurements for each tonometer and were used in the data analysis by means of difference method and total method of least squares.
Main outcome measures: Intraocular pressure.
Results: The correlation coefficient with respect to applanation tonometry was 0.96 for Ocuton a, 0.94 for DCT, 0.81 for TGDC-01 and 0.95 for Icare. The average deviation to GAT was 1.1 for Ocuton a, 2.1 for DCT, 3.1 mmHg for TGDC-01 and 2.5 mmHg for Icare. The mean standard deviation of individual measurements in each eye was 0.54 for the Goldmann tonometer, 0.70 for DCT, 2.24 for the TGDC-01 and 1.58 for the Icare tonometer. By means of difference method and total method of least squares, only the Ocuton a tonometer fulfilled the requirements of iso 8612.
Conclusions: The results of all new tonometers showed a good correlation with the reference applanation tonometric method. However, the strict requirements of iso 8612 are only fulfilled by the Ocuton a tonometer, which is an applanation tonometer, functioning according to the Goldmann principle. When judging the results of studies such as the present one, it needs to be taken into account, that the iso norm 8612 is based on a reference device that is itself not free of bias. To minimize the error of the reference tonometer, further parameters, like central corneal thickness or corneal curvature, should be considered. A new iso norm should be developed.
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P111 COMPARISON OF INTRAOCULAR PRESSURE MEASUREMENT BY GOLDMANN APPLANATION TONOMETER, OCULAR RESPONSE ANALYZER, AND DYNAMIC CONTOUR TONOMETER

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Purpose: Ocular response analyzer (ORA) and Pascal dynamic contour tonometers (DCT) are new tonometers being considered to be less influenced by corneal properties than Goldmann applanation tonometer (GAT). Our aim of this study was to compare corneal effect in intra ocular pressure (IOP) measurement among these tonometers.
Design: Prospective clinical trial.
Participants: One hundred ninety-six eyes of glaucoma, ocular hypertension and healthy subjects.
Methods: After autokeratometry and autorefractometry, IOP and corneal resistance factor (CRF) was measured by ORA, IOP by GAT, and IOP and ocular palsative amplitude (OPA) by DCT. Then central corneal thickness (CCT) was measured by ultrasonic pachymeter.
Main outcome measures: IOP, corneal thickness and curvature.
Results: IOP of each tonometry had no relation to corneal curvature (GAT: p=0.40, ORA p=0.15, DCT: p=0.97). IOP of GAT and IOP of ORA were significantly affected by CCT (GAT: p=0.0051, ORA: p=0.034). However, there was no significant statistical correlation between IOP of DCT and CCT (p=0.28).
Conclusion: DCT is less affected by corneal properties than other tonometers including ORA.
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P112 THE AGREEMENT BETWEEN DIFFERENT TONOMETERS

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Purpose: To assess the agreement between ocular response analyzer (ORA, Reichert), Goldmann applanation tonometer (GAT), non-contact tonometer (NCT, Topcon ct 80) and pascal dynamic contour tonometer (DCTt) and to determine the effects of central corneal thickness (CCT) on IOP measurements with these devices.
Setting: Yeditepe University Eye Hospital, Istanbul, Turkey.
Methods: Thirty-one right eyes and 30 left eyes of 32 normal volunteers were recruited. Twelve of the subjects were women, 20 were men. The mean age was 40.5±15.5 years. The average of GAT, ORA, DCT, NCT levels were compared and the devices were examined with respect to CCT (<520, 520-550, >550 µm). Pearson correlation test was used for statistical analysis.
Results: The mean CCT in the right eyes was 540.13±32.6 µm (range 480-597 µm) in the left eyes was 535.54±27.26 µm (range 483-589 µm). The mean IOPCC (corneal compansated) and IOPG (Goldmann corraleted) values with ORA in the right eyes were 15.55±3.09 mmHg and 15.05±3.2 mmHg. The mean values of IOP in the right eyes with DCT, NCT and GAT were 16.51±3.1 mmHg, 14.89±3.29 mmHg and 14.94±3.3 mmHg respectively. The mean IOPCC and IOPG values with ORA in the left eyes were 16.05±2.6 mmHg and 15.39 ±2.69 mmHg respectively. The mean values of IOP in the left eyes with DCT, NCT, GAT were 16.33±2.6 mmHg, 14.89±2.68 mmHg and 15.03±3.11 mmHg respectively. The highest correlation was found between IOPG and GAT (r=0.939), IOPG and IOPCC (r=0.919) and DCT and IOPCC (r=0.910) in the right eyes. The highest correlation was also found between IOPG and GAT (r=0.905), IOPG and IOPCC (r=0.903) and DCT and IOPCC (r=0.906) in the left eyes. The highest correlation between all these devices was in the eyes with CCT between 520-550 µm and the lowest correlation was in the eyes with CCT lower than 520 µm.
Conclusions: DCT values are found to be higher than the other devices. In eyes with CCT of greater than 550 µm and lower than 520 µm, the correlation between these devices is found to be decreased.

P113 FOURIER ANALYSIS OF OCULAR PULSE AMPLITUDE IN GLAUCOMA PATIENTS AND HEALTHY SUBJECTS

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Purpose: To evaluate the spectral profile of ocular pulse amplitude measurements using dynamic contour tonometry (DCT) in order to differentiate glaucoma patients from healthy subjects.
Design: Prospective cross sectional study.
Participants: Glaucoma patients and health controls.
Methods: Twenty glaucoma patients, defined by abnormal optic disc based on clinical exam and 10 healthy subjects (normal optic nerve head, normal visual field on standard automated perimetry, SAP, and intraocular pressure < 21 mmHg) were prospectively recruited. Each patient underwent 3 OPA measurements using DCT on one randomly selected eye. OPA was continuously recorded for at least 10 seconds. For each of the OPA recordings, a fourier analysis was performed. Each fourier analysis was subsequently analyzed with multivariate analysis of discriminance and artificial neural network.
Main outcome measures: Ability of OPA to discriminate between glaucoma and healthy eyes.

Results: There was no significant difference in age, refraction, or gender between glaucoma patients and healthy subjects. There was a significant difference in the fourier analyses between the two clinical groups (wilks lambda = 0.669, p < 0.008). It was possible to detect glaucoma based on the fourier analysis of the OPA with a sensitivity of 80 % at a specificity of 80% and an area under the curve (AUROC) of 0.9.
Conclusion: The fourier analysis was able to detect differences in the OPA pattern between glaucoma patients and healthy subjects. It seems useful to evaluate the spectral distribution of the OPA to examine if opa is important in the pathogenesis of glaucoma.
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P114 CLINICAL COMPARISON OF DYNAMIC CONTOUR TONOMETRY WITH GOLDMANN APPLANATION TONOMETRY ON THE BASIS OF INTERNATIONAL STANDARD ISO 8612

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Purpose: Comparison of intraocular pressure (IOP) measurements obtained by using the Pascal dynamic contour tonometer and Goldmann applanation tonometer according to international standard for human eye tonometers iso 8612.
Design: Clinical comparison measurements on 250 eyes of 127 patients were performed by two ophthalmologists according to the methods and criteria of iso 8612. A calibrated at 870 from the Haag-Streit Company served as reference tonometer. The measurements were splitted into three groups according to their IOP determined by the reference tonometer, each included a minimum of 30 eyes. Central corneal thickness was measured but not considered in this investigation.
Results: The measurements of intraocular pressure by the Pascal tonometer show an excessively high number of outliers per group, which do not correspond to the requirements of the international standard for tonometers iso 8612.
Conclusions: According to our results the measurements with the Pascal dynamic contour tonometer are not conform to the international standard iso 8612. Recent literature has shown that measurements with the Goldmann tonometer seems to be influenced by central corneal thickness. It has to be investigated if the Goldmann tonometer is suitable to serve as reference tonometer.
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6.1.2. Clinical examination methods: Intraocular pressure measurement; factors affecting IOP: Fluctuation, circadian rhythms

P115 PROGRESSION OF CHRONIC OPEN-ANGLE GLAUCOMA AND DIURNAL INTRAOCULAR PRESSURE FLUCTUATIONS

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Purpose: To evaluate whether the amplitude of day-and-night intraocular pressure (IOP) profiles influences the rate of progression of chronic open-angle glaucoma.
Design: Hospital-based clinical observational study.
Methods: The study included day-and-night profiles of IOP measurements performed on 458 patients (855 eyes) with chronic open-angle glaucoma or ocular hypertension. The 24-hour pressure profiles obtained by Goldmann applanation tonometry contained measurements at 7 a.m., noon, 5 p.m., 9 p.m., and midnight.
Results: In the whole study population, IOP amplitude was significantly (p<0.001) and positively associated with the mean (r=0.26), minimal (r=-0.23) and maximal (r=0.59) IOP values. Taking the whole study population, glaucoma progression was not associated with the IOP amplitude (p=0.09). After adjustment for age, neuroretinal rim area and the other intraocular pressure measurements, age (p<0.001) and neuroretinal rim area (p=0.05) remained as significant predictive factors in the selected Cox model. In the normal-pressure glaucoma group (n=174 eyes), progression was significantly positive associated with the minimal intraocular pressure value (p<0.001), the mean of the intraocular pressure values (p=0.024), and, less significantly (p=0.037) and negatively, with the pressure profile amplitudes. In the

high-pressure glaucoma group (n=681 eyes), rate of glaucoma progression was not associated with the IOP amplitude (p=0.734) or the other IOP parameters.
Conclusions: Taking into account the highly significant associations between the intraocular pressure amplitude and the mean, minimal and maximal intraocular pressure values suggests that it is the intraocular pressure itself, and less the pressure amplitude, which has the main influence on the rate of the glaucoma progression.
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P116 24-HOUR FLUCTUATIONS OF INTRAOCULAR PRESSURE AND BLOOD PRESSURE IN TREATED AND UNTREATED GLAUCOMATOUS PATIENTS COMPARED WITH NORMALS
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Purpose: To study 24-hour fluctuations of intraocular pressure (IOP) and blood pressure (BP) in treated or untreated eyes with ocular hypertension (OHT) or primary open angle glaucoma (POAG).
Design: Cross-sectional study.
Participants: One hundred eighty-two eyes (91 patients) were separated in four groups: group 1 (44 normal eyes), group 2 (34 eyes with untreated OHT or POAG), group 3 (80 eyes with OHT or POAG with a satisfactory diurnal therapeutic control of IOP daytime IOP ≤21 mmHg) and group 4 (24 eyes with POAG uncontrolled under maximal tolerated medication daytime IOP >21 mmHg).
Method: Applanation IOP and bp were measured every 2 hours by one observer for 24 hours in the sitting position (wake period) and in the supine position (sleep period).
Main outcome measures: The 24-hour fluctuation of IOP and BP in normal and glaucomatous eyes.
Results: The eyes in groups 1 and 3 had similar mean IOP (16.01±2.18 mmHg and 16.44 ± 2.85 mmHg), but the IOP fluctuations were larger in group 3 (4.27±1.86 mmHg compared to 3.5±0.76 mmHg, p<0.001). The fluctuations in group 2 were larger than in group 3 (5.79±1.62 mmHg vs. 4.27±1.86 mmHg, p<0.001). In groups 1 and 2 most eyes had the peak IOP in the morning (59.09% and 61.76%); in groups 3 and 4 a greater number of eyes had the peak IOP during the night (41.66% at 0-2 am in group 4). In all groups there was a trough of both systolic and diastolic bp around 2-4 am.
Conclusions: IOP fluctuations in POAG, whether untreated or with a satisfactory diurnal therapeutic control, are greater than in non-glaucoma eyes. In many treated eyes the peak IOP appears during the night.
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P117 REPRODUCIBILITY OF THE MODIFIED DIURNAL TENSION CURVE AND THE WATER DRINKING TEST
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Purpose: To verify the reproducibility of the water drinking test (wdt) response and the intraocular pressure (IOP) measurements during the modified daily tension curve (MDTC) in patients with ocular hypertension (OH) or open-angle glaucoma (OAG).
Design: Prospective study.
Participants: Eighty-eight patients with diagnosis of ocular hypertension or open angle glaucoma were enrolled. For statistical analysis, one eye was randomly selected from each patient.
Intervention: Patients were submitted to a MDTC followed by the WDT in two consecutive days by the same investigators. IOP was measured with the same calibrated Goldmann´s applanation tonometer.
Main outcome measures: For the MDTC, IOP measurements were performed at 8:00 am, 11:00 am, 14:00 pm and 16:00 pm. IOP at 16:00pm was considered as the WDT baseline IOP. Afted water ingestion, IOP was measured three times with 15 minutes intervals (16:15 pm, 16:30 pm, 16:45 pm).
Results: Intraclass correlation coefficient (ICC) values for MDTC measurements at 8:00 am, 11:00 am, 14:00 pm and 16:00 pm were 0.80, 0.82, 0.83 and 0.76, respectively. Maximum IOP, minimum IOP and fluctuation during MDTC presented ICC values of 0.85, 0.83 and 0.60, respectively. IOP peak and IOP fluctuation during WDT presented ICC values of 0.79 and 0.37, respectively. Diurnal fluctu-

ation, calculated as the difference between maximum IOP obtained with the WDT minus the minimum IOP obtained during the mdtc presented an ICC value of 0.84 (all ICC values, p<0.001).
Conclusion: IOP measurements during each time point of the MDTC presented excellent reproducibility as well as minimum IOP values detected by the MDTC and IOP peak during the WDT. The diurnal fluctuation calculated as IOP peak detected by the WDT and minimum IOP detected by the MDTC, also provided excellent reproducibility.
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P118 INTRA OCULAR PRESSURE PEAKS AND FLUCTUATION IN GLAUCOMATOUS PATIENTS WITH VISUAL FIELD PROGRESSION

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Purpose: To evaluate intra ocular pressure (IOP) peaks and fluctuation during office hours and after water-drinking test in glaucomatous patients with visual field progression.
Design: Retrospective analysis.
Participants: Eighty-one glaucoma patients with documented visual field progression
Methods: Retrospective analysis of 81 glaucoma patients with documented visual field progression according to anderson's criteria. These patients were divided into 3 groups, according to visual field damage classification: a- mild (30 eyes) , b- moderate (29) and c- severe (22) .all patients were treated with topical medication, and should have at least 4 office hour IOP measures within 6 months, under the same medication. Water-drinking test was performed in every patient to access IOP peak and fluctuation, defined as maximum IOP (detected in the WDT) - minimum IOP (detected in office hour measures). Data related to visual field mean deviation (MD), follow up time and number of topic medication were also recorded. For statistical analysis, anova post hoc multiple comparison test was used.
Results: Mean office hour IOPs in groups a, b, and c were 16.375 ± 2.41, 15.01 ± 2.67 and 13.51 ± 2.48 mmHg respectively (a vs b, p= 0.0431; b vs c, p=0.0408; a vs c, p=0.002). WDT peak pressures were 19.66 ± 3.72, 20.0 ± 4.1 and 19.38 ± 3.30 mmHg respectively (a vs b, p= 0.729; b vs c, p=0.562 and a vs c, p=0.791). IOP fluctuation in each group was 5.03 ± 3.03, 6.51 ± 3.24 and 7.18 ± 2.88 mmHg respectively (a vs b, p=0.069; b vs c, p=0.443 and a vs c, p=0.015).
Conclusions: Mean IOP measured in office hours in glaucoma patients with visual field progression are higher in the mild group compared to the severe group. Despite this fact, advanced glaucomatous eyes show similar IOP peaks and higher IOP fluctuation in the WDT. This finding suggests that eyes with advanced glaucomatous damage have lower ability to deal with transient IOP elevation.
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P119 FLUCTUATIONS OF IOP IN MEDICALLY CONTROLLED VERSUS SURGICALLY CONTROLLED GLAUCOMATOUS PATIENTS: A PROSPECTIVE TRIAL

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Purpose: To compare the IOP fluctuations of glaucoma patients treated with latanoprost 0.005% once a day to patients with controlled IOP after deep sclerectomy or trabeculectomy.
Methods: The trial included 60 patients with POAG. The medical group consisted of 20 patients using latanoprost 0.005% monotherapy and with no history of previous intraocular surgery or argon laser trabeculoplasty; the surgical groups included 20 patients controlled after trabeculectomy (TE), and 20 patients controlled after deep sclerectomy with collagen implant (DSCI). The patients in the surgical groups had a controlled IOP (<18 mmHg) without any ocular hypotensive medications. All patients underwent a diurnal tension curve (8.00 ' 17.00/3-hour intervals), followed by a water-drinking test (WDT) with the last measurement taken at 21.00. The between-group differences were tested for significance by means of analysis of variance.
Main outcome measures: IOP fluctuations.
Results: Baseline IOP was significantly different between the TE group (11.4 ± 4.4 mmHg), the DSCI group (13.3 ± 3.4 mmHg) and the latanoprost group (14.8 ± 2.3 mmHg) (p=0.006). Following the WDT, IOP significantly higher among patients treated with latanoprost (p = 0.003).
Conclusion: No wider variation in diurnal tension curve with latanoprost compared to the surgical procedures was found.

However, IOP increase during WDT was most marked in patients under latanoprost therapy.

6.1.3. Clinical examination methods: Intraocular pressure measurement; factors affecting IOP

P120 THE EFFECT OF PROSTAGLANDIN ANALOGUES ON CENTRAL CORNEAL THICKNESS OF PATIENTS WITH CHRONIC OPEN ANGLE GLAUCOMA AND PSEUDOEXFOLIATIVE GLAUCOMA. A TWO YEARS' STUDY ON 208 EYES

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Purpose: To evaluate the effect of latanoprost, travoprost and bimatoprost on the central corneal thickness (CCT) of patients with chronic open angle glaucoma (COAG) and pseudoexfoliative glaucoma (PXFG).
Design: Non-randomized, cross sectional study.
Participants and controls: A total of 104 patients (208 eyes) participated in the study. Eighty patients (160 eyes) were treated with prostaglandin analogues while 24 patients (48 eyes) treated with b-blockers, were used as controls.
Methods: Patients with no previous glaucoma treatment, ocular surgery, diabetes mellitus or corneal anomaly were treated for coag or PXFG. Central corneal thickness was measured using ultrasound pachymetry, as the average of 10 measurements with a sd <5 μm before treatment (point 0), and on 1st, 3rd, 6th, 9th, 12th, 18th and 24th month. Depending on the topical treatment patients were classified in two groups. (a): prostaglandin analogues (3 subgroups) 160 eyes, (b): b-blocker group (48 eyes). Students; t-test and paired samples t-test were used for the statistical analysis of the study.
Main outcome measures: Change in central corneal thickness.
Results: There was a significant difference between point 0 and 3rd month (549,8±47,9 versus 536,2±42,4 p=0,007). In the 6th month no significant difference was found (549,8±47,9 versus 547±47 p=0,602), while in the 18th month the mean CCT had significantly increased since the 3rd month (547±47 versus 565,4±21,1 p=0,026), but this regarded a rather small sample. In the PGF2-group, in comparison with the b-blocker group, no correlation was found between CCT and diagnosis (POAG or PXFG).
Conclusions: Application of prostaglandin analogues results in a slight but statistical significant CCT reduction on the 3rd month of treatment, similar in latanoprost, travoprost and bimatoprost. The possibility of cornea thickening under long, local PGF2 treatment has to be furtherly investigated. However, in clinical practice CCT changes might sometimes significantly influence the intraocular pressure measurement.
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P121 VARIATION OF IOP ACCORDING TO PACHYMETRY COMPARING GOLDMANN APPLANATION VS. SCHIOTZ TONOMETRY

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Objective: Comparison of Goldmann applanation tonometry (GAT) IOP, corneal central thickness (CCT) corrected GAT IOP and Schiotz IOP. To show how frequently Schiotz tonometry underestimates IOP.
Design: Prospective, comparative observational study.
Participants: Two hundred sixteen patients were studied (427 eyes), 89 (176 eyes) normals, 96 (190 eyes) POAG, 19 (38 eyes) patients with suspicious cupping and 12 (23 eyes) ocular hypertensives (OH).
Methods of testing: After a complete ocular exam including visual fields and Heidelberg Retinal Tomography, patients were classified into four categories: normal, glaucoma OH and suspicious optic nerve. We performed GAT, pachymetry with the Heidelberg pachymeter with IOP correction, followed by Schiotz tonometry with 5.5 and 10 g. Patients with significant scleral rigidity factor were excluded in this study. Statistical analysis was done by student's t test, Anova, Duncan's multiple comparisons.
Main outcome measures: Two main outcome measures were the GAT IOP corrected CCTin comparison with Schiotz IOP measurements as well as CCT measured in the different groups.
Results: Mean CCT was 540 μ ± 37.6 μ among normals, 520 μ ± 33.25 μ in glaucoma patients. Among OH it was 542 μ ± 35.49 μ and among suspicious cupping, 530 μ± 30.6 μ, with a significant ($p<0.05$) difference among the groups using the Anova analysis. When analyzing all the patients, we found mean GAT IOP was 14.27 mmHg, CCT-GAT corrected values were 14.84 mmHg, while Schiotz with 5.5 g mean IOP was 13.36 mmHg, and with 10 g, 12.67 mmHg with a statistical difference of $p<0.05$. There was a significant change of GAT values after CCT correction. Among normal patients, a +0.2 mmHg GAT-CCT correction was found, and an even bigger difference among glaucoma patients, +1.1 mmHg, where 50% of patients had thin corneas. Comparing CCT corrected GAT with Schiotz with 5.5 g weight, there is a significant 2.1 mmHg difference, and 2.6 mmHg with 10 g weight.
Conclusions: This study confirms yet again that CCT must always be taken into account when doing GAT IOP, and CCT corrected iops reflect the real IOP, which will usually be higher by 0.6 mm in all the patients. Schiotz tonometry significantly ($p<0.05$) subestimates real IOP by <2 mmHg, especially with the 10g weight. CCT is important to be in-

corporated in gat IOP study, since in our glaucoma group, 50% of patients had thin corneas.

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P122 INTRAOCULAR PRESSURE MODELING USING AGE, GENDER, AND CENTRAL CORNEAL THICKNESS MATCHED CURVES: THE SINGAPORE MALAY EYE STUDY (SIMES)

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Purpose: To model intraocular pressure (IOP) based on age, gender and central corneal thickness (CCT) in healthy subjects.

Design: population-based, cross-sectional study.

Participants: Nine hundred fourteen men and women, aged 40-79 years, without diabetes or hypertension.

Methods: A population-based, age-stratified random sampling approach was used to select participants. Participants underwent standardized examination, including Goldmann tonometry and ultrasonic pachymetry. Statistica version 6.0 and Matlab version 6.5 were used for modeling. For numerical modeling the two-layer perception was introduced. Optimizing the distribution among the classes the fitting of radial basis function network was applied. Right eye data were used for analysis.

Main outcome measures: IOP fitting for age and CCT per gender.

Results: Recorded mean of measured IOP was 14.4±3.7 and 14.9±3.3 mmHg in men and women, respectively and mean CCT was 544.4±32.5 and 541.2±32.9 microns for men and women, respectively. Measured IOP varied by 0.2±0.04 mmHg per 10 microns increase in CCT ($p<0.001$). Mean CCT decrease by 7±0.01microns per 10 year age increments for both genders ($p<0.001$). Experimentally derived IOP fitting curves modeling for CCT per gender and 10 year age groups were statistically significant ($p<0.05$), and showed different slopes for men and women. Optimizing the distinction among classes (i.e., dominance of IOP error and the absence for healthy subjects), the fitting of artificial neural networks was provided and the minimal error of the networks was obtained.

Conclusions: IOP measurements in healthy subjects should be corrected for central corneal thickness separately for men and women of different ages.

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P123 RELATIONSHIP BETWEEN BODY MASS INDEX AND WATER DRINKING TEST RESULTS

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Purpose: To verify whether the water drinking test (WDT) results can be influenced by body mass index (BMI).

Design: Cross-sectional study.

Participants: Sixty-three randomly selected eyes from 63 patients with open angle glaucoma.

Methods: Patients were submitted to a modified diurnal tension curve (IOP measurements performed at 8:00 am, 10:30 am, 14:00 am and 16:00 pm) followed by the WDT. Basal WDT IOP was considered as the mean ± SD IOP at 16:00 pm. Diurnal fluctuation was considered the difference between the highest IOP level detected by the WDT and the lowest IOP value detected by the modified diurnal tension curve. BMI was calculated as weight/height^2. For the statistical analysis, paired t test and Pearson´s correlation analysis were used.

Main outcome measures: BMI, IOP peak and IOP fluctuation.

Results: Mean ± SD BMI value was 26.42±4.02 (20.15-36.22). Mean basal±SD IOP was 24.0±3.8 mmHg. After water ingestion, mean±SD IOP peak was 29.3±4.9 mmHg ($p<0.001$), with a mean diurnal fluctuation of 5.3+2.4 mmHg. In the analysis of BMI vs WDT peak and BMI vs WDT fluctuation, r^2 values were 0.097 ($p=0.01$) and 0.003 ($p=0.65$, ns).

Conclusion: In this study, no relationship between BMI and WDT results was found.

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6.3. Clinical examination methods: Biomicroscopy (slitlamp)

P125 DECREASED FMRI SIGNAL CHANGES IN MT OF GLAUCOMA PATIENTS: A PRELIMINARY STUDY

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Purpose: To investigate the functional changes in the middle temporal area (MT) in glaucoma patients.
Design: Case series.
Participants: Two optic nerve head, RNLF, and visual field convinced glaucoma patients with asymmetric visual field defect were enrolled in this study (excluded other eye diseases that may affect the outcome of FMRI, and the contradictions of MRI examination, such as psychological disease, pace maker and any metal material in vivo). One of them was primary angle closure glaucoma (PACG), the other was a secondary glaucoma patient (trauma induced).
Methods: The information of visual acuity, intraocular pressure (IOP), refraction, slit lamp examination, fundus examination, and Humphrey Visual Field (SITA-standard 30-2 and 10-2 threshold test) of these two patients were recorded. Then, FMRI (Functional Magnetic Resonance Imaging, 3 tesla, Siemens) was performed using alternative expanding and contracting rings as stimulus. Both full screen and central 10 degree (within the normal visual field area of the patients) stimuli were presented to the patients. FMRI signal changes in bilateral MT evoked by each eye were compared.
Main outcome measures: The percentage of FMRI signal changes in MT.
Results: Either in condition of full screen stimulus or central 10 degree stimulus, FMRI signal changes evoked by the more affected eye was less prominent than that of the fellow eye. In both eyes, the central stimulus led to a more significant FMRI signal change in MT than the full field stimulus.
Conclusions: FMRI signal evoked by the affected eye was decreased in MT in glaucoma patients. There maybe a functional change in the motion processing in glaucoma patients, even at the area of visual field classified as normal by Humphrey perimetry.
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6.3.1. Clinical examination methods: Biomicroscopy (slitlamp): Anterior segment

P126 GENDER DIFFERENCES OF ANTERIOR SEGMENT MORPHOLOGY IN JAPANESE NORMAL SUBJECTS EVALUATED BY A ROTATING SCHEIMPFLUG CAMERA

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Purpose: To evaluate the gender differences in the anterior segment morphology in Japanese normal subjects measured by a rotating Scheimpflug camera (Pentacam; Oculus Inc., Lynnwood, WA, USA).
Methods: A total of 501 normal subjects (222 females and 279 males; mean age: 47.9 ± 14.3 years) who visited Kyoto Prefectural University of Medicine from March 2005 to October 2006 were enrolled. All the subjects were confirmed to be normal by glaucoma specialists, using FDT screening n-30 (Carl Zeiss Meditec, Inc.) and non-mydriatic optic disc photographs. After measuring with the Pentacam, the right eyes were chosen for the further statistical analysis (Mann-Whitney u test, Spearman's correlation coefficient by rank test). Mean central corneal thickness (CCT), anterior chamber volume (ACV), anterior chamber depth (ACD), and anterior chamber angle (ACA) were calculated and compared between females and males. The relationship between the age and each value obtained by the Pentacam was also evaluated by linear regression analysis.
Results: There were no significant differences in age between the two groups. Mean CCT, ACV, ACD, and ACA in female vs. male group were 542.1 ± 32.1 vs. 550.0±32.6 micrometer, 157.8±52.8 vs. 181.5±50.2 mm^2, 2.8±0.4 vs. 3.1±0.6 mm, 34.8±7.4 vs. 37.8±6.4 degree, respectively. All the measured values (CCT, ACV, ACD, and ACA) showed a significant difference between the female and male groups, showing that the female group displays much thinner corneas and narrower angles than the male group. CCT showed no changes with age in both groups. Anterior segments of the female eyes showed much larger changes with age than those of the male eyes.
Conclusions: There were significant differences between genders in relation to anterior segment morphology in Japanese normal subjects.
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6.3.2. Clinical exmination methods: Biomicroscopy (slitlamp): Posterior segment

P127 OPTIC DISC DAMAGE STAGING SYSTEM (ODDS)

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Purpose: To evaluate the optic disk damage staging system (ODDS), a new clinical method designed to classify glaucomatous optic disc (OD) severity based on OD size, entity of rim loss and cup shape. The accuracy, reproducibility and reliability was studied in a population sample of normal and open angle glaucoma (POAG) subjects.
Design: Consecutive observational case series.
Methods: Sixty eyes from 60 patients (comprised of normal and POAG subjects varying in defect severity) were included in the study. Slitlamp optic disc examination with a 78-diopters lens were performed by three ophthalmologists (glaucoma specialists with varying experience) to provide independently masked ODDS scores. This new method classifies the clinical aspect of the OD based on OD size (small, medium, large), entity of neural rim loss (divided in 6 stages of severity), and localization of the rim loss (4 types). In 30 eyes, repeat masked scores were obtained in the same fashion after a one-month period. Masked HRT II examinations by an experienced ophthalmic technician were preformed in all eyes. Sensitivity and specificity of ODDS in discriminating between normal and POAG patients was determined. Intra- and interobserver variability in ODDS scores and agreement with HRT II results were assessed using intraclass correlation coefficient (ICC).
Results: Specificity was 93% and sensitivity was 83%. Intraobserver ICC ranged from 0.7 to 1.0. Interobserver ICC ranged from 0.93 and 1.0 for optic disc size; 0.88 to 0.97 for entity of rim loss; and, 0.65 to 0.90 for cup shape. The agreement between ODDS scores (senior specialist) and HRT II ranged from 0.66 to 0.76.
Conclusions: This preliminary study shows that ODDS scores were quite comparable to HRT II.
Results: ODDS is easy to use in a clinical setting and provides good accuracy, reproducibility and reliability with current existing methods of evaluating the optic disc.

6.4. Clinical examination methods: Gonioscopy

P128 GONIOSCOPIC FEATURES OF EYES UNDERGOING SURGERY FOR CONGENITAL CATARACT

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Objective: To describe the pre-operative gonioscopic features of eyes undergoing surgery for congenital cataract and to correlate the findings with ocular biometry and other variables.
Design: Prospective, longitudinal cohort study.
Participants: One hundred four consecutive children who underwent cataract surgery between April 2006 to January 2007.
Methods: Baseline data was collected for 104 children, during an examination under anesthesia (EUA) prior to surgery for congenital cataract, who are being followed up for a minimum of 5 years to assess the incidence and risk factors for glaucoma following surgery for congenital cataract. Children with traumatic, steroid induced and complicated cataracts, pre-existing glaucoma and those undergoing additional surgical procedures were excluded.
Gonioscopy was performed using Koeppe lenses.
Main outcome measures: Gonioscopic features were identified and were correlated to ocular biometric and other variables measured during the EUA.
Results: Analysis was performed for right eyes only in those undergoing bilateral surgery. Gonioscopic features were identified in 103 patients; it was not possible in one patient. Open angles were identified in 94: anterior iris insertion in 9.anterior iris insertion was more common in eyes with a horizontal corneal diameter<10mms (p=0.002),axial length <18mms (p=0.001) and age <12 months (p=0.029). Other variables such as gender,presence of other ocular anomalies, central corneal thickness, vertical cup:disc ratio and type of cataract had no significant gonioscopic associations. Pre-operative IOP (Perkin's tonometry) was of borderline significance (p=0.054).
Conclusion: Open angles were seen in a majority of these eyes.anterior iris insertion was more common in younger patients with smaller eyes.
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P129 DOUBLE HUMP SIGN IS USEFUL TO DETECT PLATEAU IRIS SYNDROME EVEN BEFORE IRIDOTOMY

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Purpose: Plateau iris is one clinical form of angle closure glaucoma. The examination by ultrasound biomicroscope (UBM) is necessary to diagnose plateau iris configuration in patients without iridotomy, because many cases are associated with pupillary block. The double hump sign during indentation gonioscopy also indicate the existence of plateau iris configuration. We evaluate the usefulness of double hump sing to detect plateau iris syndrome in patients without laser iridotomy.
Design: Prospective nonrandomized clinical study.
Participants: Consecutive patients who underwent indentation gonioscopy.
Methods: Consecutive patients without patent iridotomy and who showed the double hump sign during indention gonioscopy were examined their shape of chamber angle and iris process using UBM.
Main outcome: Observation of anatomical structure in the angle and ciliary process.

Results: Eight patients who showed double hump sing (3 males and 5 females; mean age 73 years) were included in this study. UBM showed short iris root and the iris root was inserted anterior on the ciliary face, typical anatomical structure of plateau iris, in all the patients.
Conclusions: UBM confirmed all patients who show double hump sing had plateau iris configuration. We may be able to diagnose plateau iris configuration without using UBM.
References:
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P130 AGREEMENT OF SCANNING PERIPHERAL ANTERIOR CHAMBER DEPTH ANALYSIS (SPAC) AND TEMPORAL ANGLE GONIOSCOPY IN THAI POPULATION-BASED SURVEY

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Objective: To determine the correlation of scanning peripheral anterior chamber depth analysis (SPAC) and temporal angle gonioscopy for detection of occludable angle.
Design: Population-based, cross-sectional study.
Participants: Four hundred twenty-six adult people of over 40 years old examined during a Thai population-based glaucoma survey (year 2006-2007) in two rural districts of Thailand.
Methods: After collection of the demographic data, subjects were examined by spac followed by conventional gonioscopy. Glaucoma was diagnosed using ISGEO (International Society of Geographical and Epidemiological Ophthalmology) classification scheme. The SPAC results were automatically calculated and graded from 1 to 12. Each examination process was done by different investigator and the results were masked.
Main outcome measures: SPAC grading from 1 to 12, modified Shaffer's classification followed ISGEO criteria, demographic data.
Results: Eight hundred forty-five eyes of 426 people were examined, consisted of 157 men (36.9%) and 269 women (63.1%). The mean age is 57.2 (± 11.8) years old. 127/845 eyes (12%) were diagnosed as angle-closure eyes (Shaffer's classification: grade 0 or 1). Among angle-closure eyes, 36/127 eyes were men (28.3%) and 91/127 eyes were women (71.7%). The percentage of angle-closure eyes increased with ages, and higher in women. The correlation coefficient of SPAC and temporal angle is 0.395 ($p < 0.001$).
Conclusions: The correlation of spac and temporal angle is low in this study possibly due to two major confounding factors, age and sex. Because spac is designed based on Japanese-population gonioscopy, its grading-database such as ages, sex, gonioscopic characters may be different from other population. This study indicated that SPAC grading should be adjusted among different study population.
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P131 AGREEMENT OF TEMPORAL ANGLE GONIOSCOPY AND THE WHOLE GONIOSCOPIC FINDINGS OF THE EYE IN A POPULATION-BASED SURVEY

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Objective: To evaluate whether temporal angle gonioscopy can represent the whole gonioscopic findings of the eye in detecting angle closure and anatomical narrow angle.
Design: Population-based, cross-sectional study.
Participants: Eight hundred twenty-eight eyes from 419 subjects with age ≥ 40 years in 2 provinces of Thailand.
Methods: Subjects from glaucoma population-based survey underwent detail eye examination including gonioscopy. Whole eye's gonioscopic findings were classified into 3 groups; angle closure, anatomical narrow angle and open angle. Angle closure was labeled when trabecular meshwork (TM) was not visible ≥180° or an evidence of peripheral anterior synechiae. Anatomical narrow angle was defined when there was barely visible tm ≥180° without evidence of angle closure. Open angle was defined in eyes without angle closure or anatomical narrow angle. Weighted-kappa was used to calculate the agreement of temporal angle gonioscopy and the whole gonioscopic findings of the eye.
Main outcome measures: Agreement between temporal angle and results of whole-eye gonioscopic findings.
Results: Data from 828 eyes were included into the study. There were 155 male (36.99%) and 264 female (63.01%). Average age (mean ± SD) was 57.23 ± 11.80 years old.

One hundred twenty-six eyes had temporal angle grade 0-1 (modified Shaffer's grading). Of those, 87.30% (110/126) were angle closure and 12.70% (16/126) were anatomical narrow angle. In eyes with temporal angle grade 2, angle closure was identified in 6.96% (11/158), whereas 85.44% (135/158) were anatomical narrow angle. The agreement of temporal angle gonioscopy and the whole-eye gonioscopic findings was 0.871.
Conclusions: Temporal angle gonioscopy has strong agreement with the whole gonioscopic findings of the eye and is useful in detecting angle closure and anatomical narrow angle people.
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6.6.2. Clinical examination methods: Visual field examination and other visual function tests: Automated

P132 DOES AUTOMATED PERIMETRY IN GLAUCOMA PATIENTS OVER 80 YEARS ADD ANY VALUE TO THE MANAGEMENT OF GLAUCOMA IN THIS AGE GROUP?

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Objective: To ascertain whether automated perimetry is essential in the management of established glaucoma in those patients over 80.
Design: Cross-sectional study.
Participants: All patients age 80 or over with an established diagnosis of glaucoma attending glaucoma follow up clinic over a 3-month period were recruited. In all 60 patient episodes were analysed.
Method: Humprey 24-2 automated visual field perimetry was performed in all patients aged 80 years or older attending the glaucoma follow up clinic. A standardized questionnaire was administered to the patient enquiring about various aspects of the visual field test including: comfort during test, stress associated with testing, whether patients would prefer not to have field test. The visual field was assessed and given score of reliability of good, average, poor or very poor based on the reliability indices (false posive/negative rate, fixation losses).
Main outcome measures: Each patient episode was analysed with regard to whether the visual field altered or influenced the management of the patient. Scores were collected of reliability and an overall assessment was made by three independent doctors as to whether management decisions/treatment change was made based on the field test outcome and a usefulness score generated.
Results: The majority of patients found performing the automated perimetry difficult. The fields themselves were found to be unreliable. The performance of the visual field did not alter or influence the management of the the patient in the vast majority of cases.
Conclusion: Our standard clinical protocol of an automated visual field test in all patients once every year may need not be followed so strictly in patients with established glaucoma aged 80 and above. Fields do not contribute significantly to management and patients prefer not to do them.
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1. Fingeret M. Clinical alternative for reducing the time needed to perform automated threshold perimetry. J Am Otom Assoc 1995; 66: 699-705. 2. Anderson DR. Standard perimetry. Ophthalmol Clin North Am 2003; 16: 205-212. 3. Johnson CA. Recent developments in automated perimetry in glaucoma diagnosis and management. Curr Opin Ophthalmol 2002; 13: 77-84. 4. Johnson CA. Psychophysical measurement of glaucomatous damage. Surv Ophthalmol 2001; 45S3: 313-318; discussion s322-324. 5. Heijl A, Asman P. Pitfalls of automated perimetry in glaucoma diagnosis. Curr Opin Ophthalmol 1995; 6: 46-51. Review. 6. Stewart WC, Hunt HH. Threshold variation in automated perimetry. Surv Ophthalmol 1993; 37: 353-361.

P133 COMPARISON OF REPRODUCIBILITY OF FASTPAC AND SITA SHORT-WAVELENGTH AUTOMATED PERIMETRY (SWAP)

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Purpose: To compare the reproducibility of short-wavelength automated perimetry (SWAP) between fastpac algorithm (fastpac SWAP) and Swedish interactive threshold algorithm (SITA SWAP).
Design: Cross-sectional clinical trial.
Participants: Twenty normal subjects.
Methods: One eye of each subject was tested by both fastpac SWAP and SITA SWAP using the 24-2 program of humphrey field analyzer. Each subject underwent two separate sessions with the same protocol during two weeks.
Main outcome measures: Mean deviation (MD), pattern standard deviation (PSD), and retinal threshold of each tested point, test time, and reliable indices, including fixation loss rate, false negative rate, and false positive rate, were compared.
Results: Test time of SITA SWAP was significantly shorter than that of fastpac SWAP (185±19 sec vs. 386±40 sec, $p<0.01$). There was no difference in MD, PSD, and reliable indices between both algorithms. SITA SWAP showed significantly higher retinal threshold at every tested point compared with fastpac SWAP ($p<0.05$).
Conclusion: The reliability of SITA SWAP was similar with that of fastpac SWAP. In consideration of test time, SITA SWAP might be useful than fastpac SWAP to detect glaucomatous visual field defects.

Reference:
1. Bengtsson B, Heijl A, Normal intersubjects threshold variability and normal limits of the SITA and full threshold SWAP perimetric programs. IVOS 2003; 44: 5029-5034, 2. Bengtsson B, Heijl A, Diagnostic sensitivity of fast blue-yellow and standard automated perimetry in early glaucoma. A comparison between different test programs. Ophthalmology 2006; 113: 1092-1097.

P134 COMPARISON OF SHORT-TERM FLUCTUATION (SF) BETWEEN TENDENCY-ORIENTED PERIMETRY (TOP) STRATEGY AND THE NORMAL THRESHOLD STRATEGY

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Purpose: To investigate the reproducibility of the tendency-oriented perimetry known as the most time-efficient strategy by comparison of SF between top and the normal threshold strategy.
Design: Cross-sectional, comparative study.
Participants: Seventy-one eyes of 50 cases who need to test the visual field were enrolled in this study.
Methods: All subjects were received 2 phases normal g2 program test first and had a 30 minutes break, then received top g2 program test for 2 times with 15 minutes break between the two examination.
Main outcome measures: Short-term fluctuation (SF).
Results: Staging the standard normal g2 strategy visual field results according to the method introduced by Brusini. Among all subjects 30 eyes were normal, and SF of the top and the normal strategy were 1.6410±0.4203 db and 1.7867±0.4925 db respectively (p=0.041); 27 eyes were early defects, and SF of the 2 strategy were 2.5856±1.1343 db and 2.0185±0.5691 db respectively (p=0.020); 14 eyes were moderate or severe defects, and sf of the 2 strategy were 4.1457±1.0298 db and 2.6929±0.9376 db (p=0.002).
Conclusion: SF of top strategy is larger than results of the normal strategy, which suggest the lower reproducibility of top than the normal strategy. Optimal strategy for diagnosis and follow-up of glaucoma is still the normal strategy.
References:
1. Gonzalez-Hernandez M, Morales J, Azuara-Blanco A, Sanchez JG, De La Rosa MG. 2005;219:373-8. 2. Gonzales de la Rosa M, Morales J, Dannheim F, Papst E, Papst N, Seiler TJ, Matsumoto C, Lachkar Y, Mermoud A, Prunte C. Eur J Ophthalmol 2003;13:32-41. 3. King AJ, Taguri A, Wadood AC, Azuara-Blanco A. Graefes Arch Clin Exp Ophthalmol 2002;240:481-7. 4. Maeda H, Nakaura M, Negi A. New Eye 2000;14 pt 5:747-51. 5. Morales J, Weitzman ML, Gonzalez De La Rosa M. Ophthalmology 2000;107:134-42. 6. Lachkar Y, Barrault O, Le Francois A, Demailly P. J Fr Ophtalmol 1998;21:180-4. 7. Brusini P, Tosoni C. J Glaucoma 2003;12:417-26.

P135 SENSITIVITY AND SPECIFICITY OF THE ANDERSONS CRITERIA IN DETECTING EARLY GLAUCOMATOUS VISUAL FIELD DEFECTS APPLYING THE SITA-STANDARD

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Purpose: To determine the sensitivity and the specificity of the Anderson's criteria in detecting early glaucomatous visual field defects applying the SITA-standard (SITA-S).
Design: Prospective, observational case series.
Participants: One hundred forty-nine automated perimetry experienced primary open angle glaucoma and glaucoma suspected patients seen between August and November 2006.
Methods: All individuals underwent the Humphrey Field Analyzer 30-2 program using the SITA-S and disk photographs. Glaucoma or non-glaucoma was judged by disk photograph findings.
Main outcome measures: Sensitivity and specificity of the Anderson's criteria in one eye of each individuals.
Results: The sensitivity of anderson's criteria in detecting early visual field defects overall was 78.1% (95% ci;69.9 ~ 86.4%) and the specificity was 35.3% (19.2~51.4%). In each criteria, sensitivity and specificity were 77.1% (68.7~85.5%), 52.9% (36.2~69.7%) in the pattern deviation map (PD map), 63.5% (53.9~73.2%) , 58.8% (42.3~75.4) % in the pattern standard deviation (PSD) and 62.5 (52.8~72.2 %), 61.8 % (45.4~78.1%) in the glaucoma hemi-field test (GHT), respectively.
Conclusions: The most effective criteria for detecting early glaucoma visual field defects was the PD map, and the sensitivity of the Anderson's criteria overall was satisfactory.
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P136 VISUAL FIELD ABNORMALITIES DETECTION BY FREQUENCY DOUBLING PERIMETRY VERSUS HUMPHREY FIELD ANALYZER IN PRIMARY OPEN ANGLE GLAUCOMA

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Objectives: To determine the sensitivity and specificity of frequency doubling perimetry (FDP) and the agreement between fdp and Humphrey visual field (HVF) analyzer in detecting visual field abnormalities in POAG patients.
Design: Prospective, comparative, cross sectional study.
Participants: There were 150 POAG patients involved in the study.
Methods: All patients underwent both FDP in screening and threshold modes 30-2 and HVF 30-2 test. Patients underwent comprehensive ophthalmology assessment including visual acuity, IOP, cup-disc-ratio measurement and anterior chamber angle assessment.
Main outcome measures: Glaucoma staging system 2 (GSS2) for HVF and frequency doubling technology staging system 2 (FDT SS2) were used to classify characteristics and severity of glaucoma.
Results: Data from129 out of150 POAG patients were selected and analyzed following inclusion, exclusion criteria and reliability of the visual field testing. For FDP in screening mode, when 'at least 1 missed point' was used as the definition forabnormal FDP, the sensitivity was high be-

tween 92.2% to 96.2% and specificity was between 36.7% to 54.2%. When 2 or more missed points, was used as definition for abnormal visual field, the sensitivity was 89.5% to 95.0% and specificity between 45.2% to 62.5% was achieved. For FDP in threshold mode when tabulated against various definitions for abnormal visual field on HVF, the sensitivity was between 83.5% to 100% and specificity between 22.4% to 75.9% were recorded. Kappa value for FDP and HVF was between 0.264 to 0.536 which showed slight to fair agreement.
Conclusion: In this study, FDP showed high sensitivity but low specificity in the detection of visual field abnormalities. The new classification for severity of glaucoma with glaucoma scoring system 2 (GSS2) and frequency doubling technology scoring system 2 (FDT SS2) was able to provide immediate and reliable classification for both severity and characteristic of VF defect. Kappa value of slight to fair agreement was obtained between FDP and HVF.
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6.6.3. Clinical examination methods: Visual field examination and other visual function tests: Special methods (*e.g.*, color, contrast, SWAP, etc.)

P138 SIMULTANEOUS PUPILLOGRAPHIC MULTIFOCAL VISUAL FIELD ASSESSMENT OF BOTH EYES

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Purpose: To investigate the sensitivity and specificity of 10 variants of multifocal pupillographic perimetry in the diagnosis of open angle glaucoma.
Design: Experimental design.
Participants: Ten stimulus protocols were examined in two blocks of experiments. Block one contained 22 normal and 23 glaucoma subjects; block two: 20 normal and 20 glaucoma subjects. Disease state or status as a normal subject was confirmed by examining all subjects with HFA achromatic, SWAP and matrix 24-2 perimetry, stratus oct, slit lamp and tonometry. Informed written consent was obtained from all subjects under ANU ethics approval 238/04.
Methods: In all ten protocols independent multifocal stimuli were presented concurrently to both eyes with a dartboard layout, having 24 independent test regions/eye extending to 30 deg eccentricity. The test recording duration for each of the 10 protocols was 4 minutes, divided into 8 segments of 30 s each. Stimuli in each protocol could differ in the presentation rate per dartboard region (0.25, 1, 4 presentations/s), stimulus duration/presentation (66, 133 or 266 ms), flicker rate on each presentation (0, 15, or 30 hz) or luminosity (80, 150 and 290 cd/m²). Background luminance was 10 cd/m². Since both pupils responded to stimuli from both eyes, 48 responses/eye were obtained giving 96 contraction amplitude and 96 delays each 4 min test.
Main outcome measures: The relative diagnostic accuracies of the 10 protocols were examined using sensitivities and specificities derived from receiver operator plots. The simultaneously highest sensitivities and specificities, often called the accuracies, are presented in this abstract.
Results: The table gives percent accuracies (right 2 columns) illustrating that the best performance was obtained at, shorter presentation durations, and the highest presentation rates, flicker rates and luminances. The right-most column labelled amplitude + delay shows accuracies for a linear discriminant model combining these measures from each visual field region. The top two table rows show outcomes for the best non-flickered and flicked stimuli from the first block of 6 protocols (table row 2). The bottom 4 rows of the table show outcomes for the 4 protocols of block 2.
Conclusions: In agreement with a previous study on 20 normal and 26 glaucoma subjects reported at this meeting, flickering stimuli could achieve quite high sensitivities and specificities. This study indicates higher presentation and flicker rates combined with higher luminance stimuli can yield sensitivities and specificities around 95% for test durations equivalent to 2 min/eye. Our recent advance in multifocal methods permit these short test durations.
References:
1. James AC, Maddess T, et al. Visual Neurosci 2005; 22, 45-54.

P139 CONCURRENT BINOCULAR MULTIFOCAL PUPILLOGRAPHIC FIELD TESTING

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Purpose: This study was a preliminary investigation of a means of concurrently assessing the visual fields of both eyes by recording the responses of both pupils to independent stereoscopically presented multifocal stimuli, to investigate the sensitivity and specificity of this as a method for objective perimetry for glaucoma.
Design: Experimental design.
Participants: The 20 normal subjects were given a thorough eye exam including HFA achromatic 24-2 fields (SITA) and fundus photography assessed by a single skilled observer. The 26 open angle glaucoma patients had stable, moderate to severe, HFA fields. Subjects were age and sex matched. All subjects gave written consent in accordance with the helsinki declaration and anu human ethics protocol 238/04.
Methods: Dichoptic stimulation was provided via a pair of stereoscopically arranged lcd displays. The subject thus saw a single cyclopean stimulus. Each display presented

a circular dart-board-like array of 24 stimulus regions extending to 30 deg eccentricity. Each region in each eye received independent stimulus presentations at a mean rate of 1/s. Four stimulus presentation conditions were tested: each stimulus region containing either a single or a 2x2 array of patches, being presented either steady for 133ms or flickered half-on half-off at 15 hz for 266ms. For each of the 4 tests the recording duration was 4 minutes, divided into 8 segments, or 2 minutes per eye.
Main outcome measures: Sensitivities and specificities for each of the 4 stimulus protocols as obtained from receiver operator plots.
Results: Both pupils were recorded with 24 regions mapped in each eye, giving a total of 96 responses/subject from each 4 minute record. The regressive analysis method meant that about 10% of each record could be lost due to blinks etc. Without affecting accuracy. The median peak pupil contraction amplitudes expressed as z-scores for the 4 conditions were 4.1, 3.3, 3.2 and 2.3. The best diagnostic performance was obtained by taking the mean of the 10 worst deviations from the normal profile across the visual field regions, providing a joint sensitivity and specificity of 85% for the flickered single patch condition.
Conclusions: The pupillographic multifocal method provided diagnostic accuracy that approached that of standard perimetry even though the raw test time was equivalent to 2 min per eye. Measuring the visual fields of the two eyes concurrently has statistical advantages for comparing the two eyes. Unlike perimetry the method provides both sensitivity and temporal dynamics for each visual field region. Unlike evoked potential based multifocal methods pupillography requires no additional setup time for electrode placement. Further experiments also presented at this meeting indicate that with modification of the stimulus parameters can improve sensitivity and specificity.
References:
1. James AC, Maddess T, et al. Visual Neurosci 2005; 22, 45-54. 2. James AC. IOVS 2003; 44, 879-90.

P140 DETECTING EARLY GLAUCOMA WITH 24-2 PATTERN FREQUENCY DOUBLING TECHNOLOGY PERIMETRY: COMPARISON WITH THE N-30 THRESHOLD TEST

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Purpose: First-generation frequency doubling technology (FDT) perimetry reportedly detects glaucomatous visual field abnormalities earlier in the disease process than standard automated perimetry (SAP). Second-generation FDT perimetry, Humphrey matrix, made it possible to test a visual field using smaller stimuli than those of first-generation FDT perimetry. This enables us to examine the visual field using a pattern the 24-2 pattern similar to that of the Humphrey field analyzer (HFA). The sensitivity and specificity in detecting early glaucoma are reported to be better with second-generation FDTt perimetry than with SAP, although whether small stimuli of second-generation FDT perimetry improve sensitivity and specificity in detecting glaucoma has not been fully evaluated. The purpose of this study was to investigate whether the smaller stimuli of the 24-2 pattern FDT improved the ability to detect glaucoma at early stages. We compared the 24-2 FDT threshold test (FDT 24-2) with the n-30-f threshold test (n-30), which is a program included in first-generation FDT perimetry.
Design: Prospective, nonrandomized clinical trial.
Participants: Seventeen-one eyes of 43 patients with early stage or suspected glaucoma were included in this study.
Methods: Upper and lower hemifields of the participants were analyzed separately. The discriminatory capability of n-30 and fdt 24-2 was assessed based on the results of hfa 24-2 Swedish Interactive Thresholding Algorithm Standard Test.
Main outcome measures: Visual fields measured by FDT and HFA, test duration, and sensitivity and specificity of n-30 and FDT 24-2 to detect early glaucomatous visual field loss.
Results: FDT 24-2 took a significantly longer time to administer than n-30. The sensitivities in 35 HFA-defective hemifields with corresponding optic disc change were 86% for FDT 24-2 and 71% to 89% for n-30. The specificities in 55 HFA-intact hemifields without glaucomatous change in the corresponding half of the optic disc were 92% for FDT 24-2 and 62% to 93% for n-30. Of the 40 HFA-intact hemifields with glaucomatous change in the corresponding half of the optic disc, 43% were abnormal for FDT 24-2, and 33% to 73% were judged abnormal for n-30.
Conclusions: FDT 24-2 is a useful method to evaluate glaucomatous visual field loss in patients with early-perimetric and pre-sap glaucoma, although it takes more time to administer than n-30.
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P141 FLICKER PERIMETERY IN DIAGNOSIS GLAUCOMA WITH COEXISTING LENS OPACITIES

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Purpose: To evaluate the effectiveness of critical fusion frequency (CFF) perimetry in diagnosis of patients with glaucoma neuropathy and lens opacities.
Design: Prospective, one-centre clinical study.
Participants and control: Fifty eyes of fifty patients with glaucoma and cataract, before cataract surgery. Each patient underwent CFF and W/W perimetry examination before and 1 month after cataract surgery.
Methods: The single instrument Octopus 301, the same test locations and the same strategy (program g1, top strategy) were applied, before and 1 month after surgery.
Main outcome measures: The best spectacle-corrected vi-

sual acuity (BSCVA) on the Snellen chart, Goldmann applanation tonometry and mean defect (MD) and loss variance (LV) indices for CFF and W/W perimetry were analyzed.
Results: The mean value of visual acuity has increased by 5 lines on the Snellen chart after surgery. The mean value of IOP decreased from 17.0±1.31 mmhg to 11.5±1.85 mmhg after the operation (p=0,000). Before surgery the MD for CFF was 13,83±8,73 hz, and 16,98±5,02 DB for W/W perimetry, and after surgery 12,86±7,06 hz (p=0,058) and 14,06±7,3 DB (p=0,045) respectively. Before surgery the LV for CFF was 80,8±54,03 hz, and 38,5±20,57 DB for W/W perimetry and one month after surgery was 81,2±58 hz (p=0,97) and 48,9±29,87 DB (p=0,0482).
Conclusion: CFF perimetry allows evaluating the function of the retina in patients with glaucoma neuropathy and lens opacity.
Reference:
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P142 CORRELATION OF STRUCTURE AND FUNCTION OF THE OPTIC NERVE USING HUMPHREY MATRIX 24-2 PERIMETRY, STANDARD AUTOMATED PERIMETRY AND NERVE FIBER LAYER ANALYSIS WITH GDXVCC IN PRIMARY OPEN ANGLE GLAUCOMA

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Purpose: To study the correlation between humphrey matrix 24-2 threshold strategy (matrix), standard automated perimetry 24-2 sita-strategy (SAP) and nerve fiber layer thickness parameters using scanning laser polarimetry with variable corneal compensation (GDXVCC).
Design: Cross-sectional observational study.
Participants: In this study 60 eyes with POAG suspect (suspicious disc, normal fields SAP) and 25 eyes with early POAG (glaucomatous disc changes and visual field defects on SAP and matrix) were included. All eyes had visual acuity better than 6/9 with correction, refractive error of less than ±5d sphere and ±3d cylinder with no media opacities.
Methods: All subjects underwent 24-2 sap, matrix 24-2 visual fields along with other detailed evaluation including gonioscopy, applanation diurnal IOP recording and GDXVCC.
Main outcome measures: Time duration and global indices (MD, PSD) of visual fields. TSNIT average thickness and NFI on GDXVCC were assessed.
Results: Mean age of patients was 55.6 ± 7.3 yrs and 58.6 ± 6.4 yrs in POAG suspect and early POAG respectively. Mean time taken for each visual field was 5.76 and 5.20 minutes in matrix and SAP. In POAG suspect, mean MD and PSD by SAP vs matrix were 2.58±1.89 vs 3.48±3.50 and 2.02±1.05 vs3.28±0.75 respectively. There was a statistically significant difference in both MD and PSD of SAP and matrix ($p<0.001$, ($p=0.047$). In early POAG group, mean MD and PSD by SAP vs. matrix were 7.31 ± 4.29 vs 7.73 ± 3.76 and 6.28 ± 4.26 vs 5.65 ± 2.63 respectively. In this group there was no significant difference in the MD and PSD using any of the two techniques. By GDXVCC, mean NFI of POAG suspect and early POAG were 23.89± 12.68 and 40.35 ± 19.22 with a significant difference between NFI and TSNIT average between two groups ($p=0.001$). There was a significant negative correlation in early POAG patients between MD of both SAP and matrix with NFI ($p=0.01$ and 0.005 respectively) in POAG suspect group, matrix showed field defects in 24 eyes, whereas only 16 eyes had NFI >30.
Conclusions: There is a good correlation between humphrey matrix perimetry, standard achromatic perimetry and scanning laser polarimetry. POAG suspects may be monitored using humphrey matrix perimetry and GDXVCC.
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P143 FREQUENCY DOUBLING PERIMETRY IN PREDICTING GLAUCOMA IN A POPULATION-BASED STUDY: THE BEIJING EYE STUDY

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Objective: To determine the predictive value of frequen-

cy doubling threshold perimetry (FDT) for glaucoma in a population-based study.
Design: Population-based cross-sectional study.
Participants: The study population consisted of 4439 subjects aged 40+ years in rural and urban areas of Beijing. The present investigation consisted of 8617 eyes of 4350 (98.0% of the original study population) subjects (2434 women) for whom readable photographs and reliable FDT results were available.
Methods: All participants underwent an ophthalmological examination including an ophthalmic examination with fundus photography and FDT.
Main outcome measures: Glaucoma was defined by a glaucomatous optic disc appearance. FDT c-20-1 program was applied. Reliable results of FDT were defined as false positive rate and fixation loss not more than 1/3. More than 1 grid abnormality of FDT was defined as perimetric defect. Sensitivity and specificity were used to measure the value of FDT to detect glaucoma.
Results: Among 214 (2.5%) glaucomatous eyes, 79 (36.9%) eyes did not show any FDT abnormality, suggesting a diagnostic sensitivity of 63.1%. In the total study population, a visual field defect was found for 906 (10.5%) eyes. In 135 (14.9%) of these eyes, a glaucomatous appearance of the optic disc was detected, and 771 (85.1%) eyes had a non-glaucomatous optic disc appearance (either normal or non-glaucomatous optic nerve damage, retinal disease, corneal disease or cataract). For 452 (49.8%) eyes with a visual field defect, a cause for the perimetric defect was not detected.
Conclusions: In a population-based study, FDT has a sensitivity of about 63% to detect glaucoma. If FDT is abnormal, probability for glaucoma is about 15%. In case of an abnormal frequency doubling perimetry, a cause for the visual field defect may not be detectable in 50% of the subjects.
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P144 CHARACTERISTICS OF FREQUENCY DOUBLING PERIMETRY TESTING IN GLAUCOMA DIAGNOSIS IN A POPULATION BASE STUDY: THE BEIJING EYE STUDY

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Objective: To find the characteristics of visual field abnormality of FDT in glaucomatous and non-glaucomatous eyes and a more effective evaluation modula using FDT in glaucoma screening.
Design: Population-based cross-sectional study.
Participants: The study population consisted of 4439 subjects aged 40+ years in rural and urban areas of Beijing. The present investigation consisted of 8617 eyes of 4350 (98.0% of the original study population) subjects (2434 women) for whom readable photographs and reliable FDT results were available.
Methods: All participants underwent an ophthalmological examination including an ophthalmic examination with fundus photography and FDT.
Main outcome measures: Glaucoma was defined by a glaucomatous optic disc appearance. Reliable results of FDT were defined as false positive rate and fixation loss not more than 1/3. Percentage of abnormality and its correlation with glaucoma in any location of the 17 FDT testing grids were analyzed separately grid by grid. Hierarchical clustering and discriminate analysis were applied.
Results: 4350 (98.0%) subjects (8617 eyes) provided measurement data by frequency doubling perimetry. 8617 eyes provided reliable FDT results, in which 905 eyes showed abnormal FDT results and 205 eyes were diagnosed as glaucoma. The positive percentage of each testing location ranged from 1.8% to 5.1%. According to our numbering rule, grid 1, 2, 4, 5, 12, 13 had positive judging power and grid 0, 11 had negative in glaucoma prediction. The 3 grids in nasal inferior were strongly related with glaucoma. After using the algorithm to detect glaucoma in population, the falsely classification percentage was 4.5%.
Conclusions: Each testing location of FDT had ranging contributions to glaucoma predicting. Nasal inferior grids showed a more convincing value in glaucoma screening, while the central 2 locations had negative predictive value. We conducted a discriminate algorithm whose accuracy to predict glaucoma in populations increased from 90.2% to 95.5%, which showed a more promising judging power.
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P145 RAREBIT PERIMETRY IN NORMALS: TEST-RETEST VARIABILITY, LEARNING EFFECT, NORMATATIVE RANGE, INFLUENCE OF OPTICAL DEFOCUS AND CATARACT EXTRACTION.

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Purpose: To study the normative range, reproducibility, learning effect and influence of optical defocus and cataract extraction with rarebit perimetry (RBP).
Methods: Sixty-four normals underwent visual field (VF) testing with standard automated perimetry (SAP) and RBP. Normative ranges were determined for all RBP parameters. RBP learning effect and test-retest variability (TRV) determinations (mean of the differences between paired tests) were based on 4 repeated measures within 3 months in 18 normal subjects. Optical defocus was studied in 13 normals that each underwent consecutive blurred RBP tests with spherical (SF) lenses (from 1.00d to 6.00d SF). The effect of cataract extraction was studied in a separate group of 23 patients scheduled for cataract surgery (RBP testing a week before and a month after surgery). Mean hit rate (MHR), standard deviation (MHR-SD), mean miss rate (MMR), number of tested areas with hit-rate <90% (#hr<90%), and test duration were analyzed.
Results: Mean MHR was 925.4% (range 80-99%); MHR-SD was 8.43.3% (range 3.4-15.2%); mean #HR<90% was 4.33.9% (range 0-18%); MMR for single areas ranged from 2.9-11.0%. MHR significantly decreased (mean 0.23%/year) as age increased. Mean RBP test time was 25726.4 s. No significant learning effect was observed. TRV ranged from: 03.6% for MHR,0.013.5% for MHR-SD,0.022.5 for #HR<90% and 0.011.1% MMR for individual areas. MHR and MHR-SD increased with the refractive blur (significantly for lenses=+3d). Tests after cataract surgery showed significant increases in MHR and decreases in MHR-SD. The effect of optical defocus and cataract extraction was significantly higher in the 4 central VF areas.
Conclusions: The RBP is a rapid and easily accessible VF test. RBP testing did not show a learning effect, however, inter- and intra-subjects variability was high. Blur and media opacities may give false positive results in RBP, especially in the central VF, and should thus be considered.

P146 ACQUIRED COLOUR DEFICIENCIES IN GLAUCOMA
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Purpose: Visual perception consists of three components; light, form and color sense. Most previous glaucoma investigations depend on light and form senses. The present study deals with the effect of glaucomatous optic neuropathy on colour sense.
Design: Prospective and comparative case series.
Participants: Study includes 13 controls age-matched subjects and 21 patients with ocular hypertension (OH), normal tensive glaucoma (NTG), primary open angle glaucoma (POAG), and chronic narrow angle glaucoma (CNAG), aged between 20 to 58 years.
Methods: Both control subjects and glaucoma patients were subjected to the new pseudo-isochromatic colour testing plates (Nassar Colour Testing Plates). These plates can deal with protanomal, deuternomal and tritanomal changes, in order to detect early-acquired colour vision deficiencies (CVD) in different types of glaucomas.
Main outcome measure: The incidence of blue-yellow deficiencies was significantly high in POAG and CNAG versus OH and NTG. Red-green deficiencies were noticed in later stages of glaucoma.
Results: The group of patients, who manifested CVD in the glaucoma group, was below the extreme limits of the control ones. The tritanomal portion was prominent and increased with the increased severity of the visual field defects in glaucoma patients.
Conclusion: Colour sense is an important component in visual perception and can be used as an indicator to the amount of damage in glaucomatous optic neuropathy. Tritanomal colour plates can predict the existence of glaucoma.
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P147 RESURRECTION OF AMSLER CHART, IS IT STILL VALID?
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Purpose: To reintroduce (primary introduced since 947) the ability of Amsler chart to diagnose and properly locate any lesion within the precious central 10° of the retina.
Design: Prospective comparative case series.
Participants and controls: A total number of 143 eyes (104 patients) with different types of retinal, choroidal or optic nerve affection
Methods: the patients were subjected to full Amsler grid testing and compared to other diagnostic investigative instruments to each patient.
Main outcome measures: Amsler chart may predict lesions ahead 2-6 months before other diagnostic tools.
Results: Amsler grid testing corresponded with the diagnosis achieved by other types of investigations in 123 (86%)

eyes and predicted the lesion ahead by 2-6 months in 20 (14%) eyes by other diagnostic investigative instruments.
Conclusion: Amsler chart is a simple, inexpensive, accurate tool and of mass screening ability that easily and precisely detects different lesions. The predictability of threshold Amsler grid testing in diagnosis of different types of diseases can properly guide other sophisticated diagnostic investigations to proper diagnosis.
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6.7. Clinical examination methods: Electro-ophthalmodiagnosis

P148 SIMULTANEOUS BINOCULAR STIMULATION IMPROVES GLAUCOMA DETECTION WITH MULTIFOCAL VISUAL EVOKED POTENTIALS

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Objective: To determine if simultaneous binocular stimulation for multifocal visual evoked potentials (MFVEP) (a) detects glaucomatous field loss and (b) improves inter-eye asymmetry analysis.
Design: Cross-sectional study.
Participants: Twenty-eight glaucomatous persons; 30 normals. Excluded: Cataract, non-repeatable fields.
Methods: All participants underwent MFVEP on monocular and binocular stimulation. Binocular: Simultaneous binocular stimulation was presented using virtual reality goggles (figure 1) display to each eye was a 56-segment cortically scaled dartboard. Pattern-onset stimulation was used. Three runs, lasting 139 seconds each, were recorded. Monocular: Monocular MFVEPs were recorded sequentially for each eye using accumap™ v2.0. Five runs, lasting 56 seconds each, were recorded for each eye.
Outcome measures: a)Detection of scotomata by binocular and monocular MFVEP and correspondence with HVF. b) Inter-eye asymmetry: relative asymmetry co-efficient (RAC) was calculated as (difference in amplitudes)/ (sum of amplitudes) for binocular and monocular MFVEP.
Results: Normals: Comparison of mean RAC on monocular and binocular MFVEP revealed significantly lower RAC on binocular (0.003±0.03) compared to monocular testing (0.02±0.04) (p=0.002). Glaucoma: In all 28 patients, binocular MFVEP identified defects, all of which corresponded topographically to HVF defects. Of 56 hemifields (of 28 eyes) examined, 33 (28 eyes) had HVF scotomata, all of which were detected by binocular MFVEP, including 2 misses on monocular MFVEP. Among 23 hemifields (of 23 eyes) with no HVF defects, 2 were abnormal on monocular and binocular MFVEP. Additionally 5 hemifields (5 patients, 17.9% of patients) that were normal on HVF and monocular MFVEP were abnormal on binocular MFVEP. In all 5 patients, corresponding rim changes were appreciated on disc photographs . Four of the 5 patients were identified by asymmetry analysis. Mean RAC of glaucomatous eyes was significantly higher on binocular (0.283±0.18) compared to monocular (0.199±0.12) tests (p=0.0006). When hemifields with and without HVF defects were examined separately, difference in mean hemifield RAC between tests was significant for affected (binocular RAC 0.443±0.20, monocular RAC 0.328±0.16; p<0.0001) but not unaffected hemifields. (binocular rac 0.09 ± 0.08, monocular RAC 0.075 ± 0.06; p=0.5).
Conclusion: Binocular MFVEP not only detects HVF losses, but also identifies early defects in areas unaffected on HVF and monocular MFVEP. Asymmetry is tighter among normals but wider in glaucoma on simultaneous binocular stimulation, a potential new tool in early glaucoma detection.
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P149 RATES OF VISUAL FIELD AND PERG CHANGES OVER 4 YEARS IN EARLY GLAUCOMA

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Purpose: To compare changes of visual sensitivity and retinal ganglion cell (RGC) activity over time in patients with early glaucoma.
Methods: Ninety-six patients (mean age 60.3 ± 11.6 years, 128 eyes) with normal corrected visual acuity (≥20/20) and free from retinal diseases, but with either suspicion of glaucoma (GS) or early manifest glaucoma (EMG) were repeatedly (n > 6 times) tested over 4.1 ± 0.6 years with both standard automated perimetry (SAP) and PERG (Porciatti and Ventura, Ophthalmology 2004). GS patients had optic disc abnormalities and one or more risk factors for glaucoma. EMG patients had either repeatable mild to moderate SAP defects or signs of progressive disc changes. Mean intraocular pressure was 15.9 ± 4.3 mmHg, and mean vertical cup-to-disc (c/d) ratio was 0.54 ± 0.18. PERG amplitude and phase were expressed as db deviations from age-predicted values. Mean PERG and SAP deviations for the 4-year observation period, as well as rates of change (linear regressions in db/year) were calculated and compared.
Results: Mean deviations were: SAP MD1.28 ± 1.77 db; PERG amplitude1.26 ± 1.55 db; PERG phase 0.19 ± 0.33 db. SAP and PERG amplitude mds were weakly correlated (r=0.35). PERG amplitude and phase MDs were not correlated. The number of significant (p<0.05) abnormalities depended on the different tolerance intervals (TI) of

the normal population for different measures. Assuming a3 db lower 95% TI for SAP md, and2db and0.38 db for PERG amplitude and phase, respectively (Porciatti and Ventura, Ophthalmology 2004), the percent of eyes with abnormal deviations were: SAP MD: 12%, PERG amplitude MD: 31%; PERG phase: 24%. Mean rates of change were: SAP:0.09 ± 0.54 db/year (not significantly different from zero), PERG amplitude: 0.28 ± 0.38 db/year (different from zero, p<0.001); PERG phase:0.03 ± 0.07 db/year (different from zero, p<0.001). The percent of eyes with significant (p<0.001) regressions were: SAP 1%; PERG amplitude: 6%; PERG phase: 5%.
Conclusions: While SAP and PERG amplitude display similar average MDS, there is a greater percentage of eyes with abnormal deviations for PERG amplitude and phase than SAP. Compared to SAP, the rate of change for PERG amplitude and phase is more skewed towards negative values, which reaches statistical significance in a substantial percent of eyes. The PERG offers promise to signal RGC dysfunction and its progression in early glaucoma. It remains to be established if progressive PERG changes predict future SAP changes in early glaucoma.

P150 MULTIFOKAL VEP IN ELDERLY GLAUCOMA PATIENTS WITH NASAL VISUAL DEFECTS

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Purpose: To evaluate if MF-VEP is useful as a complement test to Humphrey visual field test.
Design and Participants: Eighteen glaucoma patients, aged 78 MD (54-88 range) years, with known nasal visual field defects were included. Twenty-five age matched healthy controls underwent equal examination as did a group of twenty (aged 40 years MD). Younger healthy subjects. The patients underwent two MF-VEP examinations where the uncrossed visual pathways to the visual cortex were analyzed. The response from these pathways are known to give the highest amplitudes in healthy subjects.
Methods: All participants had the electrodes placed laterally. MF-VEP were recorded using veris 4.3 system. The visual stimuli were displayed on a screen in an IR camera which was simultaneously used as a fixation control. The amplitudes in certain squares of the nasal field were compared between the included patients and the age matched controls. A further comparison was made between the aged matched controls and the younger group.
Main outcome and Results: Patients with severe defects in the nasal field on the Humphrey visual field (MD12-20) showed lower amplitudes in the corresponding area of the MFVEP, p= 0.001-0.009 compared to the healthy aged matched group. There was also a difference between younger and older healthy subjects p= 0.018. On average.
Conclusion: MFVEP can be used to monitor visual field defects and might be useful in certain groups of patients.
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6.8. Clinical examination methods: Photography

P151 QUANTIFICATION OF OPTIC DISC MORPHOLOGY ON STEREOSCOPIC PHOTOGRAPHS

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Objective: Optic disc screening by photographs has been routinely included in population-based glaucoma surveys for glaucoma. Although novel digital imaging technologies are now capable of fairly accurate optic disc assessment, stereoscopic evaluation by experienced examiners still remains to be the optimum method and population-based screening requires stereoscopic photography without pupil dilation. We recently developed a new method to quantitatively assess optic disc morphology on stereoscopic photographs taken by a nonmydriatic fundus camera. Using the system, the disc and cup contours can be traced on the photographs to determine the vertical and horizontal cup disc ratio and rim/disc diameter ratio at an arbitrary axis which are indispensable for glaucoma screening in a population-based study, and disc area and cup/disc area ratio. The aim of this study is to evaluate intra-examiner and inter-examiner reproducibility of those parameters in normal and glaucomatous eyes.
Design: A cross-sectional study.
Participants: Seventeen normal eyes of 10 normal subjects and 69 glaucomatous eyes of 52 open-angle glaucoma patients were included in the study.
Methods: Stereoscopic photographs of the optic disc were taken by a nonmydriatic fundus camera (topcon, trc-nw7sf). Using the originally developed stereoscopic viewer, one examiner traced the disc and cup contour upon the stereographic image three times for each eye. Next, the same photographs were traced by two other examiners.
Main outcome measures: Interclass correlation coefficients (ICC) and coefficient of variance (CV) were calculated for the repeated traces by the same examiner, and for the traces by three different examiners.
Results: Within the same examiner, ICCS for disc area, cup/disc area ratio, and horizontal and vertical cup disc ratios were between 0.93-0.99 (p<0.001) and CV was between 1.5 and 3.1%. ICCS for rim/disc diameter ratios were between 0.92 and 0.96 (p<0.001) and CV was between 3.4 and 7.2%. Among the three examiners, ICC ranged between 0.63 and 0.78 for the same parameters (p<0.001) and CV was between 4.5 and 12.9%.
Conclusion: Using the newly developed method, the optic disc configuration can be quantitatively and easily evaluated on stereoscopic photographs with good intra-examiner and

inter-examiner reproducibility. The current method should be useful in a population-based glaucoma screening.

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6.8.1. Clinical examination methods: Photography: Anterior segment

P152 GONIO-IMAGING USING THE CGAL CONTACT LENS

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Objective: Gonio-imaging is one of the most challenging missions in ophthalmic photography. The Goldmann 3-mirror lens was designed for general use in ophthalmic examination and many skilled photographers have produced good quality images of the anterior eye and iridiocorneal angle. The CGAL (Roussel and Fankhouser) was conceived primarily to enhance laser treatment in the anterior chamber but many of the design features also improve its imaging ability over that of the 3-mirror. The poster will highlight the differences between the CGAL and the Goldmann 3-mirror lens. The advantages of the cgal will be explained and samples of the image quality achievable will be included.

6.9. Clinical examination methods: Computerized image analysis

P153 COMPARISON OF ANTERIOR CHAMBER DEPTH MEASUREMENTS USING THE IOLMASTER, SCANNING PERIPHERAL ANTERIOR CHAMBER DEPTH ANALYSER AND ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

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Objective: To compare anterior chamber depth (ACD) measurement by three non-contact devices, the iolmaster, scanning peripheral anterior chamber depth analyser (SPAC) and visante anterior segment optical coherence tomography (AS-OCT).
Design: Prospective, cross-sectional study.
Participants: Four hundred ninety-five phakic subjects above the age of 50, attending a community clinic in Singapore.
Methods: ACD of right eye in subjects was measured using iolmaster, SPAC and AS-OCT by the same investigator.
Main outcome measures: The ACD was measured from the corneal epithelium to the anterior lens surface, and acd measurements were compared using Bland-Altman analysis.
Results: A total of 232 men and 265 women were examined, with a mean age of 63.4 ± 7.9 (SD) years. The mean ACD was 3.08 ± 0.36 mm with iolmaster, 3.10 ± 0.44 with SPAC and 3.14 ± 0.34 with AS-OCT. A significant difference was noted between the acd measurements recorded by the three devices ($p < 0.0001$) with AS-OCT measurements being deeper than iolmaster and SPAC. The mean difference between AS-OCT and iolmaster measurements was 0.062 ± 0.007 mm ($p<0.0001$, 95% limits of agreement (LOA): 0.37 mm to 0.25 mm); between AS-OCT and SPAC was 0.035 ± 0.011 ($p=0.0001$, 95% LOA:0.44mm to 0.51mm) and between SPAC and iolmaster was 0.027 ± 0.012 ($p=0.027$, 95% LOA: 0.57 mm to 0.50 mm).
Conclusions: AS-OCT measurements of ACD are deeper than those with SPAC and iolmaster. However, as the differences found were small, they are unlikely to be clinically important.

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P154 COMPARISON OF THE DIAGNOSTIC CAPABILITY OF STRATUS OCT 3, GDX VCC AND HRT II FOR EARLY GLAUCOMA IN INDIAN EYES

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Purpose: The aim of the present study was to compare diagnostic capability of the optical coherence tomography

(Stratus OCT 3), scanning laser polarimetry (GDX VCC) and confocal scanning laser tomography (HRT2) for early glaucoma in Asian Indian eyes.
Design: Cross-sectional observational study.
Participants and/or controls: Two groups of patients (early glaucoma and normal) who satisfied the inclusion and exclusion criteria were included. Early glaucoma was diagnosed in presence of open angles, characteristic glaucomatous optic disc changes correlating with the visual field on automated perimetry (visual field defect fulfilling at least two of three anderson and Patella's criteria with mean deviation less negative than or equal to 6 db). Normals had visual acuity ≥ 20/30, intraocular pressure (IOP) < 22 mmHg with normal optic disc and fields and no ocular abnormality.
Main outcome measures: Sensitivity, specificity, positive (PPV) and negative predictive values (NPV), area under ROC (AUROC) and likelihood ratios (LR) were calculated for various Stratus OCT 3, HRT 2 and GDX VCC parameters.
Results: Seventy eyes (70 patients) with early glaucoma and 94 eyes (94 normal subjects) who fulfilled inclusion and exclusion criteria were enrolled in the study. The mean age was 55.2 ± 9.2 years, the male-female ratio was 43:27 in early glaucoma group. The mean age was 52.4 ± 10.9 years, the male-female ratio was 56: 38 in normal. Best combination of sensitivity and specificity were obtained with 6-clock hour RNLFt (61 % and 99% respectively) for OCT3, NFI score more than 50 (nerve fiber index) (53 % and 99% respectively) for GDX VCC and (50 % and 96% respectively) with Moorefield regression analysis (both borderline and outside normal limit) for HRT. At 5 % disease prevalence, positive and negative predictive values were highest with oct 3 (75 % and 98% respectively). MRA (outside normal limit) has positive lr of 14 and 6-clock hour RNLFt had 59 and for GDX VCC, NFI > 50 had positive lr of 55 for early glaucoma.
Conclusion: Our results show that the oct has best combination of sensitivity and specificity for the diagnosis of early glaucoma. The positive predictive values with OCT 3 were high enough to warrant consideration of use of the imaging test for screening of early glaucoma. Calculation of likelihood ratio will help us in providing additional information for diagnosis of early glaucoma.
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6.9.1.1. Clinical examination methods: Computerized image analysis: Laser scanning: Confocal scanning laser ophthalmoscopy

P155 COMPARISON OF THE OPTIC NERVE HEAD ISNT RULE OBTAINED BY CLINICAL EXAMINATION WITH THE HEIDELBERG RETINA TOMOGRAPH 3 MODIFIED ISNT RULE IN GLAUCOMA SUBJECTS

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Purpose: In a healthy optic nerve head the neuroretinal rim width is usually the widest inferiorly, followed by superiorly, nasally and temporally (ISNT rule). In glaucomatous eyes this rule is frequently broken. The aim of this study was to determine the sensitivity of the modified isnt rule obtained by the Heidelberg Retina Tomograph (HRT 3) in glaucoma patients with violation of the ISNT rule.
Design: Cross-sectional study.
Participants: A total of 108 eyes of 58 glaucoma patients were included. The patients had intraocular pressure higher than 21 mmHg on Goldmann applanation tonometry, open angles on gonioscopy, achromatic visual field defects consistent with glaucoma, and violation of the ISNT rule on fundus examination with 78-diopter lens.
Methods: All patients were scanned with the HRT without pupil dilation. The HRT modified ISNT rule states whether the following applies: rim area inferior > superior > temporal, and was used for comparison. The rim area is measured on the inferior (247.5° 337.5°), superior (22.5° 112.5°) and temporal (337.5° 22.5°) segments. HRT images with topographic standard deviation > 50 µm were excluded.
Main outcome measures: The sensitivity of the modified isnt rule obtained by HRT 3 in glaucoma patients with violation of the ISNT rule.
Results: From the 108 glaucomatous eyes with violation of the ISNT rule, only 48 eyes (sensitivity: 45%; 95% confidence interval: 35%-54%) were correctly identified by the HRT 3 software as not fulfilling the ISNT rule.
Conclusions: The HRT 3 modified ISNT rule has low sensitivity and, therefore, may not be useful in clinical practice.
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P156 ARE NORMAL OPTIC NERVES SYMMETRIC?

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Purpose: Optic nerve asymmetry has long been considered an indicator of glaucomatous optic neuropathy. Normative scanning laser topographic parameters have been created for individual eyes, but paired comparisons to determine normal symmetry are not available. This study establishes parameters of symmetry for normal pairs of eyes.
Design: A normative database consisting of 281 pairs of eyes was accessed. All subjects were caucasian and had no ocular pathology that might affect the optic nerve. We calculated the mean differences between eyes (left-right eye), standard deviations, and coefficients of variations (COV) for global and sectoral parameters including: disc area, cup area and volume, rim area and volume, cup shape measure, and mean retinal nerve fiber layer (RNLF).
Results: Pairs of eyes were, on average, symmetric with low cov. Rim volume and mean RNLF thickness were the two parameters with the highest cov. For each of these the sector contributing the greatest variability was the temporal/inferior. Global results are summarized in the table.
Conclusions: We have established normative parameters for optic nerve symmetry in healthy eyes. These parameter can be used to develop additional tools for the identification of glaucoma based on loss of symmetry.

P157 HERITABILITY OF OPTIC DISC PARAMETERS MEASURED BY HEIDELBERG RETINAL TOMOGRAPHY IN CHINESE SCHOOL-AGED CHILDREN: GUANGZHOU TWIN EYE STUDY

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Purpose: To assess the heritability of optic disc parameters in Chinese children using Heidelberg Retinal Tomography (HRT).
Design: Classic twin study.
Participants: Three hundred fifty-seven monozygotic and 203 dizygotic twin pairs aged 7 to 15 years identified from Guangzhou twin registry and being eligible for HRT analysis.
Methods: Guangzhou twin registry was established in 2005. Twins living in two districts closest to the examination station were recruited from this registry. Optic disc parameters were measured using a HRT device by the same examiner and grader. Zygosity was confirmed by genotyping with 16 polymorphic markers in all same-sex twin pairs. The outcomes of the right eye were in analysis. All twin pairs with retinopathy of prematurity, other congenital eye diseases or missing data on HRT were excluded. Heritability was assessed by structural variance component genetic modeling using MX software.
Main outcome measures: Disc area (DA), cup area (CA), cup disc area ratio (CDAR), horizontal and vertical cup disc ratio (HCDR, VCDR)
Results: The mean age of the subjects was 10.8±2.6 years (range 7-15 years). Mean DA, CA, CDAR, HCDR, VCDR were 1.98 sq mm (0.46), 0.52 sq mm (0.33), 0.24 (0.12), 0.52 (0.16) and 0.36 (0.17) respectively. All parameters were not associated with age and gender (p>0.05). The variance component model identified 77.9% additive genetic (95%CI: 73.6~81.4%) and 22.1% unique environment (95%CI: 18.6~26.4%) for DA, 82.6% (95%CI:79.2~85.4%) and 17.4% (95%CI: 14.6~20.7%) for CA, 77.8% (95%CI: 73.6~81.3%) and 22.2% (95%CI: 18.7~26.3%) for CDAR, 64.6% (95%CI: 58.3~70.1%) and 35.3% (95%CI: 29.9~41.7%) for HCDR, 72.1% (95%CI: 66.9~76.4%) and 27.9% (95%CI: 23.6~33.1%) for VCDR respectively being best fit.
Conclusions: Optic disc parameters were not associated with age and gender in Chinese children. The disc parameters are highly determined by genetic variation.
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P158 OPTIC DISC PARAMETERS IN NORMAL TENSION GLAUCOMA

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Purpose: To compare the optic disc parameters in normal-tension glaucoma, POAG and healthy persons and to evaluate the influence of optic disc size on the variables of optic disc generated by the Heidelberg Retina Tomograph ii.
Participants: The study included 48 patients with normal tension glaucoma, 517 normal eyes in healthy persons and 270 eyes with primary open angle glaucoma (POAG). Normal tension glaucoma (n=48) was defined as an IOP never documented above 21 mmHg, normal drainage angle and anterior chamber appearance, typical glaucomatous optic nerve head damage and visual field damage. Primary open angle glaucoma (n= 270) was defined as an intraocular pressure consistently above 21 mmHg without antiglaucoma treatment, normal drainage angle and anterior chamber appearance with no apparent ocular abnormality that may account for the elevated IOPs, typical glaucomatous visual field defects and/or optic nerve head damage.
Methods: All normal subjects (n=517) had full ophthalmologic examinations. All had a visual acuity of 0.6 or better, normal optic disc appearance and normal visual field tests. All subjects had a refractive error of within 5 dioptres

from emmetropia. The optic disc parameters (stereometric and volumetric) were measured using a computerized imaging system HRT II.
Results: In normal eyes, the optic disc size shows a high interindividual variability. Age was not a determinant of optic disc area and there are no differences in disc area between men and women. The optic disc size were significantly larger in patients with normal-tension glaucoma than in healthy persons (p< 0.001)
Conclusion: There is controversy over the definition, appearance, and characteristics of the optic nerve head in normal-tension glaucoma. Our results indicate that eyes with normal pressure glaucoma have larger optic discs than eyes with primary open angle glaucoma or normal eyes. For this reason, it is necessary to make actual measurements of the size of optic disc features, rather than relative measurements that vary with optic disc size (such as the cup/disc ratio), in order to distinguish pathological from physiological optic disc.

P159 OPTIC NERVE HEAD INDICES AND RETINAL NERVE FIBRE LAYER THICKNESS AMONG PRIMARY ANGLE CLOSURE GLAUCOMA AND PRIMARY OPEN ANGLE GLAUCOMA

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Objective: To compare the optic nerve head (ONH) indices on Heidelberg Retinal Tomography (HRT) and the retinal nerve fibre layer (RNLF) thickness using optical coherence tomography (OCT) between established and pre-perimetric primary angle closure glaucoma (PACG) and primary open angle glaucoma (POAG).
Design: The study was a retrospective cross-sectional observational study.
Participants: In the study 72 eyes of 36 POAG patients and 56 eyes of 28 PACG patients were enrolled.
Methods: Patient records were reviewed and Humphrey visual fields were graded according to the Hodapp Anderson Parish classification. The two groups (POAG and PACG) were divided into two sub-groups - patients with normal standard automated perimetry (SAP) with Humphrey visual field analyser (HFA) and abnormal SAP with HFA.
Main outcome measures: Comparison of the ONH indices and RNLF thickness between the two groups was done. The ONH indices on HRT and the RNLF thickness on OCT were analyzed using t-test and the anova test.
Results: Our series had 46 male and 18 female patients. The mean age in the POAG group was 54.3 years (SD10.28) and PACG group was 58.29 years (SD10.11) (p=0.13) In the preperimetric glaucoma group, the mean cup depth was significantly deeper for PACG (0.3674 mm) as compared to 0.2913 mm for POAG (p=0.036). The inferior average RNLF thickness in the POAG group and the PACG group with SAP defects was 77.89 microns (SD 30.01) and 95.26 microns (SD 25.84). (p=0.04)
Conclusions: ONH indices using HRT and RNLF thickness using OCT are similar in patients with POAG and PACG. In the preperimetric glaucoma group, the mean cup depth was significantly deeper for PACG as compared to POAG. The inferior average RFNL thickness shows a statistically significant difference between the two groups for established glaucoma.

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P160 ASSESSMENT OF IOP RELATED DEFORMATION OF THE LAMINA CRIBROSA USING CONFOCAL SCANNING LASER OPHTHALMOSCOPY

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Purpose: To assess by confocal laser ophthalmoscopy (CSLO) the alterations in the position of anterior laminar surface and to study its relationship with the intraocular pressure (IOP) following trabeculectomy in adult patients with glaucoma.
Design: Prospective, interventional study.
Participants: Twenty-five eyes of 25 adult patients (age>18 years) scheduled for trabeculectomy were recruited.
Methods: Optic disc imaging was performed with a confocal scanning laser ophthalmoscope (CSLO) using Heidelberg Retina Tomograph (HRT-1), pre-operatively and at one week, one month and 3 months following trabeculectomy.
Main outcome measures: The volume-below-surface minus volume-above-surface (VBS-VAS), cup volume (CV) and mean cup depth (MCD) were correlated to the IOP at each visit. Logarithmic regression curves were fitted to each parameter and the slope calculated for various IOP ranges. The change in anterior-lamina-volume (S), percentage change in CV, and MCD was correlated to the percentage change in IOP.
Results: Mean age was 47.2 ± 16.1 years. The IOP, cup volume, mean cup depth and vol S at three months changed significantly compared to the pre-operative values (p=< 0.001; <0.001; 0.001 and < 0.001 respectively; table 1). VBS-VAS, CV and MCD correlated significantly to the IOP (p=0.002, <0.001 and 0.005 respectively). Logarithmic regression slopes were significant for all parameters less than 22.0 mmHg, after which the slope flattened (fig. 1). The change in anterior lamina volume significantly correlated to the percentage change in IOP at the three months follow-up (p=0.025).
Conclusion: The relationship between IOP and movement of the anterior surface of the lamina cribrOSA is non-linear, with most of it occurring at lower ranges of IOP.

P161 IMPROVEMENT OF GLAUCOMA DIAGNOSIS WITH HEIDELBERG RETINA TOMOGRAPHY (HRT) IN JAPANESE MYOPIC EYES

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Objective: Myopia, a risk factor for open angle glaucoma (OAG), is much more prevalent in Japanese than in Caucasians and ellipse-shaped optic discs are frequently seen in Japanese with myopia. We tried to improve glaucoma diagnostic power of HRT by incorporating a parameter representing ovality into discriminant function in glaucoma eyes associated with myopia.
Design: Cross-sectional study.
Participants: Spherical equivalent refraction of all subject eyes was ≦-3d and one eye from a subject was used HRT I data obtained in 69 OAG (48.4±10.8 yrs old, MD 6.20±5.43) and 66 normal eyes (38.0±11.3 yrs old), and HRT II data obtained in 33 OAG (60.3±7.4 yrs old, MD 5.32±5.73) and 18 normal eyes (49.2±6.8 yrs old) were included.
Methods: The ratio of disc diameter along the long axis of the disc which was determined on the HRT print out to that along the short axis perpendicular to the long axis (l/s ratio) was used as a parameter of ovality of the disc. Using eyes with HRT i data, significantly contributing HRT parameters to discrimination between glaucoma and normal eyes were searched by step-wise method and the discriminant function thus obtained was applied to eyes with HRT II data. Sensitivity and specificity of the obtained discriminant function (JHC) was compared to those of the moorfields regression classification (MRC), and the HRT classification (FMS).
Results: A discriminant function y= 1.505*l/s ratio+0.039*age+1.362*rim area+6.532*height variation contour-8.676*rim volume+6.895*cup shape measure-4.063, was obtained. Sensitivity and specificity of the JHC, MRC and FMS were 93% and 83%, 73% and 83% and 75% and 88%, respectively in eyes with HRT II data. Sensitivity of the JHC was better than that by MRC or FMS ($p<0.01$), while specificity showed no significant difference ($p>0.1$) among the three methods.
Conclusion: Incorporating of a parameter representing ovality of the disc improved the sensitivity of detecting glaucoma by HRT in Japanese myopic eyes.
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P162 MOORFIELDS PROGRESSION ANALYSIS A NOVEL HRT EVENT ANALYSIS

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Purpose: To describe an event analysis (EA) for monitoring Heidelberg retina tomograph (HRT) progression and to establish specificity, detection rate and agreement with visual field progression by application to longitudinal data.
Design: Retrospective analysis of a randomized controlled trial.
Participants: One hundred ninety-eight ocular hypertensive and 21 control subjects.
Methods: Change criteria were derived from rim area (RA) repeatability coefficients for different levels of image quality. EA 1 - 4 were applied to longitudinal series of HRT images acquired from the ocular hypertensive and the control cohort: ea1 (change confirmed in 2 of 3 consecutive tests in 1 or more sector), EA2 (2 of 3 in 2 or more sectors), EA3 (3 of 3 in 1 or more sector), EA4 (3 of 3 in 2 or more sectors). Specificity (1 - false positives) was estimated by the proportions of progressing controls and significantly improving subjects. Progression rates were compared to advanced glaucoma intervention study (AGIS) VF criteria, an HRT trend analysis and a vf trend analysis, with specificity matched at 95 %.
Main outcome measures: Estimated specificity, progression rate and agreement between progression techniques.
Results: Specificity estimates were 85.7 - 87.2 % (EA 1), 94.1 - 95.2 % (EA2), 90.5 - 91.0 % (EA3) and 99.1 - 100 % (EA4). 45%, 28%, 30% and 17% of OHT subjects were identified as progressing by each strategy, respectively. With specificity at 95%, 12.1 % of OHTs progressed by both EA2 and AGIS criteria, median time to progression 3.2 years and 3.6 years respectively. 16.2% progressed by EA2 alone and 9.6% by AGIS alone. RA trend analysis identified 12% of OHT subjects as progressing.
Conclusions: The HRT event analysis represents a simple technique, taking into account image quality. In this cohort, it had a higher detection rate, at 95 % specificity, than RA trend analysis and the VF progression criteria.
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P163 THE SPATIAL PATTERN OF HRT-DEFINED NEURORETINAL RIM LOSS IN OCULAR HYPERTENSION

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Purpose: To assess the spatial pattern of decline in rim area (RA) in ocular hypertension as measured with the Heidelberg Retina Tomograph (HRT).
Design: Retrospective analysis of a randomized controlled trial.
Participants: One hundred ninety-eight ocular hypertensive (OHT) subjects.
Methods: Subjects were examined prospectively with the HRT from 1993-2001. One eye per subject was selected for analysis, with a median 10 (range 5-16) HRT mean topographies available for each eye, processed using the 320 µm reference plane and a novel reference plane, which fixes the reference plane to the height of the standard reference plane at baseline relative to the reference ring. Linear regression analysis of RA over time was performed for each of the HRT explorer pre-defined sectors; temporal (T), superotemporal (ST), inferotemporal (IT), nasal (N), superonasal (SN) and inferonasal (IN).
Main outcome measures: The mean slope of ra loss (mm^2/year) in each sector was compared, as was the frequency of significant slopes in each sector.
Results: Using the 320 µm reference plane, it slopes were steeper than T, SN and IN slopes (p = 0.03, 0.01 and 0.03, respectively, paired t-test) and ST slopes were steeper than SN slopes (p = 0.005, paired t-test). Using the new reference plane, ST slopes were steeper than T, SN and IN slopes (p = 0.0001, 0.0031, 0.0002, respectively, paired t-test) and IT slopes were steeper than T, N, SN and IN slopes (p = 0.0001, 0.042, 0.005, 0.0001, respectively, paired t-test).
Conclusions: Although there are significant differences in the rate of RA loss between some sectors, using the 320 µm reference plane, the differences are small, when considered as a percentage of total RA. A similar frequency of significant RA loss occurs in each sector with the exception of the temporal which may have greater localised variability. Using the newer reference plane, the expected pattern of rim area loss, predominantly in the ST/IT sectors seems to be more apparent. Regardless of reference plane, our results indicate that rim loss in the nasal sector may be under-appreciated.
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P164 OPTIC NERVE HEAD CHARACTERISTICS IN THE ADULT PAKISTAN POPULATION- THE PAKISTAN NATIONAL BLINDNESS AND VISUAL IMPAIRMENT SURVEY

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Purpose: To characterize the optic nerve head morphology in the adult population of Pakistan.
Design: Cross-sectional study within a population-based nationally-representative survey.
Participants: Subjects were adults examined in the Pakistan national blindness and visual impairment survey1-2. One out of every 5 subjects over the age of 40 years consecutively attending for examination underwent optic disc analysis with the Heidelberg Retina Tomograph (HRT II; Heidelberg, Germany). 255 eyes of 130 patients were analyzed.
Methods: The HRT II is a confocal scanning laser ophthalmoscope which has been shown to have high reproducibility and repeatability of measurements3-5. Images from both eyes of each subject were acquired and then stored electronically. Images were exported onto the HRT-III software, the disc margin contour line drawn and analysis performed in the accredited reading centre at moorfields eye hospital.
Main outcome measures: Stereometric optic disc parameters.
Results: Mean age was 51.3 ± 0.9 years. Mean (± standard deviation) disc parameters were as follows: disc area 1.97 mm^2 ± 0.48, rim area 1.39 mm^2 ± 0.39, cup/disc area ratio 0.27 ± 0.17, rim/disc area ratio 0.73 ± 0.17, rim volume 0.36 mm^3 ± 0.17, cup volume 0.13 mm^3 ± 0.13, mean cup depth 0.21 m^3 ± 0.09, retinal nerve fiber layer thickness 0.23 mm ± 0.09. There were no significant differences in disc parameters between left and right eyes or between the sexes.
Conclusions: Many studies have indicated that there are differences in optic disc parameters between ethnic populations 3-5. By characterising the optic discs of this 'normative' group of subjects in the Pakistan population study we hope to improve our understanding of variations in different racial groups which may be of use in improving the diagnostic accuracy of instruments.
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P165 HRT 3 GLAUCOMA PROBABILITY SCORE, MOORFIELDS REGRESSION ANALYSIS AND STEREOMETRIC PARAMETERS FOR PREDICTION OF VISUAL FIELD LOSS IN GLAUCOMA SUSPECTS

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Purpose: Recent studies have shown that measurements from optical imaging instruments can be predictive of the development of repeatable abnormal visual field results in glaucoma suspects. We sought to evaluate the ability of the new operator-independent confocal scanning laser ophthalmoscopy (HRT 3, Heidelberg Engineering) glaucoma probability score (GPS), and compare to the operator-dependent Moorfields regression analysis (MRA) and stereometric parameters, for predicting visual field loss in glaucoma suspects.
Design: Prospective observational cohort study.
Participants and controls: Two hundred and fifty nine eyes of 259 glaucoma suspects were recruited from the longitudinal diagnostic innovations in glaucoma study (DIGS). Eligible eyes had standard automated perimetry tests, optic disc stereophotograph and HRT imaging at baseline. Included suspects had suspicious optic disc appearance and/or elevated intraocular pressure (IOP), but normal visual fields.
Methods: Conversion was defined as development of repeatable abnormal visual fields (pattern standard deviation (PSD) with $p < .05$ and/or a glaucoma hemifield test (GHT) outside normal limits) during follow-up. The association between baseline GPS, MRA and stereometric parameters with conversion was investigated by Cox regression models.
Main outcome measures: Hazard ratios for HRT parameters were obtained from multivariable models adjusted for other known risk factors, i.e., age, IOP, central corneal thickness and PSD.
Results: Fifty-two (20.1%) eyes developed glaucomatous visual field defects during follow-up. In multivariable models, both GPS and MRA results were predictive of conversion. Adjusted hazard ratios (95% CI) were 5.51 (2.59 to 11.71) for an outside normal limits global GPS classification and 2.81 (1.52 to 5.19) for an outside normal limits overall MRA classification. Several stereometric parameters were also significantly associated with development of visual field loss in multivariable models. Adjusted hazard ratios for mean retinal nerve fiber layer thickness (RNLF) and RNLF cross-sectional area were 1.99 (1.23 to 3.10; per 0.1 mm thinner) and 1.47 (1.15 to 1.89; per 0.3 mm² smaller), respectively.
Conclusion: HRT 3 baseline results were predictive of visual field loss in glaucoma suspects. These findings suggest that objective optic disc assessment with the HRT could potentially be used as a predictive tool for estimating the likelihood of a glaucoma suspect patient developing visual field loss.

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6.9.1.2. Clinical examination methods: Computerized image analysis: Laser scanning: Confocal scanning laser polarimetry

P166 THE CORRELATION BETWEEN FUNDUS STEREOSCOPY , VISUAL FIELD, AND SCANNING LASER POLARIMETRY IN EARLY GLAUCOMA

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Purpose: To evaluate the results of fundus stereoscopy and scanning laser polarimetry (SLP) in the detection of retinal nerve fiber layer defects (RNLFD) in early glaucoma and the correlation between SLP parameters and visual field retinal sensitivity in early glaucoma.
Design: Cross-sectional study.
Participants: Twernty-four eyes of 24 early primary open angle glaucoma patients and 12 eyes of 12 early primary angle closure glaucoma patients were recruited.
Methods: Routine ophthalmological exams, visual field (Humphrey field analysis 24-2), scanning laser polarimetry (GDX ECC, full exam) were performed. In the agreement of detecting RNLFD, the RNLFD pattern and localization should be the same. Visual field was divided into 6 zones which related to different RNLF area.
Main outcome measures: The parameters of SLP (GDX ECC), fundus stereoscopy image report, retinal sensitivity of visual field zones (Humphrey field analysis 24-2), and the correlation between the parameters of GDX ECC and visual field retinal sensitivity.
Results: The agreement of detecting RNLFD in early glaucoma between fundus stereoscopy and GDX ECC was 50%. Three ratio parameters of GDX ECC (superior nasal, inferior ratio, maximum modulation) were significantly associated with their corresponding visual field zones retinal sensitivity ($p<0.05$), while thickness parameters not ($p>0.05$) by Pearson correlation test.
Conclusions: No satisfactory agreement of detecting RNLFD was revealed between fundus stereoscopy and GDX ecc in the early glaucoma. The correlation between thick-

ness parameters and their corresponding visual field zones retinal sensitivity was weak, while that of the ratio parameters was significant. Combining visual field retinal sensitivity and GDX ecc ratio parameters could be helpful in early detection of glaucoma.

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P167 INTRAOBSERVER REPRODUCIBILITY OF RETINAL NERVE FIBER LAYER MEASURMENT USING SCANNING LASER POLARIMETERY WITH VARIABLE CORNEALCOMPENSATION IN GLAUCOMA SUSPECT PATIENTS

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Purpose: To evaluate intraobserver reproducibility of RNLF measurment using GDX-VCC in glaucoma suspect patients.
Design: Cross-sectional.
Participants: RNLF measurments were performed in 26 eyes of 26 glaucoma suspect patients using GDX-VCC .the test repeated immediately by the same operator.
Results: The mean coefficient of variation for measuremets of the variables ranged from 0.76 (symmetry) to 0.98 (NFI).
Conclusion: GDX showed a good test-retest corralation and acceptable intraobserver reproducibility.

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P168 ASSESSMENT RETINAL NERVE FIBRE LAYER THICKNESS BY SCANNING LASER POLARIMETRY (GDXVCC) IN NORMALS, POAG SUSPECTS AND EARLY POAG PATIENTS

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Purpose: To evaluate the ability of scanning laser polarimetry with variable corneal compensation (GDXVCC) to detect differences in retinal nerve fiber layer (RNLF) thickness between normal, primary open angle glaucoma (POAG) suspects and early POAG eyes.
Design: Observational case control study.
Participants: This study included 100 eyes of normal subjects (normal disc with normal visual fields), 50 eyes with suspected POAG (suspicious disc, normal fields) and 50 eyes with early POAG (glaucomatous disc and visual field defects).
Methods: All patients underwent 30-2 sita standard visual fields, slit lamp biomicroscopy, gonioscopy, applanation diurnal IOP recording and GDXVCC.
Main outcome measures: The main outcome measures included TSNIT average, superior and inferior average and NFI.
Results: Mean age in all three groups were comparable. The TSNIT average (µm) in normal subjects, POAG suspects and early POAG were 54.17±4.60, 49.76±6.54 and 46.92±6.23 respectively (table 1). All the parameters of GDXVCC showed significant difference between POAG and normal subjects ($p<0.001$) with NFI having highest AUC of 0.920 and specificity and sensitivity of 90% and 83% at a cut off of >26.5 (table 1 and 2). The multilevel likelihood ratios for glaucoma were 0 at NFI values of <15, 0.36 at values between 15 and 25, 1.76 at values between 26 and 35, and 61.50 at values of >35 (table 3). All the parameters showed significant difference between POAG suspects and normal subjects ($p<0.001$) with NFI having highest AUC of 0.793 and specificity and sensitivity of 80% and 60% at a cut off of >24.5.all the parameters except inferior average showed significant difference between POAG and POAG suspects $p=0.049$, $p=0.01$ and $p<0.001$ for TSNIT average, superior average and NFI respectively with NFI having highest auc of 0.730 and specificity and sensitivity of 80% and 56% at a cut off of >33.
Conclusions: GDXVCC has good sensitivity and specificity to differentiate between normal and early POAG. NFI

was the best discriminating parameter with no likelihood of developing glaucoma below a value of 15 and very high likelihood if NFI more than 35. The discriminating ability of the instrument between normals vs POAG suspects and POAG suspects vs early POAG is poor.

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P169 EFFECT OF CATARACT SURGERY ON RNFL THICKNESS PARAMETERS USING SCANNING LASER POLARIMETRY (GDXVCC)

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Purpose: To study the effect of cataract surgery on RNLF thickness assessment by GDXVCC.
Design: Prospective case study.
Participants: Twenty-five subjects with age related nuclear cataract with IOP < 21 mmHg, normal disc and visual fields and best corrected visual acuity of 20/60 or better.
Methods: All subjects underwent RNLF analysis by scanning laser polarimetry (GDXVCC) before undergoing phacoemulsification cataract extraction with IOL implantation (acrysof SA 60 at) and 3 days after cataract surgery.
Results: Mean age of subjects were 54.3 ± 12.4 years. There were 15 males and 10 females. Mean TSNIT average thickness (um) pre and post cataract surgery was 57.81 ± 26.43 and 62.61 ± 35.0 ($p < 0.001$), mean NFI pre and post cataract surgery was 31.81 ± 11.61 and 19.94 ± 8.66 ($p = 0.003$) respectively. There was a significant increase in RNLF thickness parameters (TSNIT average, superior average and inferior average) and decrease in NFI post cataract surgery as compared to baseline values (p value ranged from 0.003-<0.001)).
Conclusions: Measurement of RNLF thickness parameters by scanning laser polarimetry is significantly altered by cataract surgery. The presence of cataract may lead to underestimation of RNLF thickness and this should be taken into account while judging progression. Post cataract surgery, a new baseline needs to be established for monitoring the patient.

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P170 EFFECT OF DIFFERENT OBSERVATION DIAMETERS ON RETINAL NERVE FIBRE LAYER THICKNESS MEASUREMENT BY SCANNING LASER POLARIMETRY (GDXVCC) IN NORMALS, GLAUCOMA SUSPECTS AND EARLY GLAUCOMA PATIENTS

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Purpose: To study the ability of retinal nerve fiber layer thickness (RNLF) at 3 scan diameters using GDXVCC in discriminating between healthy, glaucoma (POAG) suspects and early POAG.
Design: Observational case control study.
Participants: One hundred eyes of normal subjects (normal disc with normal visual fields), 50 eyes of POAG suspects (suspicious disc, normal fields) and 50 eyes of early POAG (glaucomatous disc and early visual-field defects by HAP-criteria)
Method: RNLF parameters were measured by GDXVCC (Laser Diagnostics, California) at 3 different observation circles - conventional small, medium and large.
Outcome measures: TSNIT average, superior average, inferior average and NFI.
Results: TSNIT average (μm) normal vs. POAG suspects vs. POAG at 3 different diameter circles 54.17 ± 4.6 vs 49.96 ± 6.5 vs 46.92 ± 6.2 (small); 47.17 ± 4.8 vs 43.79 ± 5.7 vs 41.48 ± 6.5 (medium); 41.57 ± 4.6 vs 39.77 ± 5.9 vs 38.33 ± 7.1 (large). All parameters of all circles showed significant difference between normal and early POAG eyes ($p<0.001$). AUC was 0.911 for NFI at all circles ($p<0.001$). All parameters at small and medium circle and all except TSNIT average at large circle showed significant difference between normal and glaucoma suspect eyes ($p<0.001$), AUC being highest (0.801) for NFI at large circle ($p<0.001$). All parameters except inferior average at small circle, superior average and NFI at medium circle and NFI at large circle showed significant difference between glaucoma suspect and early POAG eyes ($p<0.05$), with AUC being highest (0.731) for NFI at small circle ($p<0.001$). All parameters progressively decreased significantly with increasing circle diameter (table 1). There was significant difference between small vs. medium ($p<0.001$), medium vs. large ($p<0.001$) and small vs. large circle re-

sults (p<0.001) of all the groups and for all the parameters except NFI. The TSNIT average at small circle was 13% more than the medium circle and 23% more than the large circle in normal subjects.
Conclusions: The RNLF thickness decreases with an increasing scan radius on GDXVCC. Medium and large circle scans can also be used for detection of RNLF damage in POAG in addition to the conventional small circle scan. This will be especially useful in RNLF measurements in eyes with significant peripapillary atrophy.
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P171 EVALUATION OF RETINAL NERVE FIBER LAYER THICKNESS PARAMETERS IN MYOPIC POPULATION USING SCANNING LASER POLARIMETRY (GDX VCC)
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Objective: To evaluate the retinal fiber layer (RNLF) thickness in low, moderate and high myopia and compare it with emmetropes using scanning laser polarimetry with variable corneal compensation (GDX VCC).
Design: Observational cross sectional study.
Participants: Eighty-two eyes of emmetropes, 30 eyes of low myopes (0 to 4 d spherical equivalent), 45 eyes with moderate myopia (-4 to 8 d spherical equivalent), and 29 eyes with high myopia (-8 to15 d spherical equivalent). All subjects were normal subjects without any features of glaucoma. Persons with disc anomalies were excluded.
Methods: The retinal nerve fiber layer assessment was performed using the scanning laser polarimetry (GDX VCC) (Laser Diagnostic Technologies, San Diego, California) in all subjects using standard protocol. Visual acuity, IOP, fundus assessment with 90d lens and SITA fast was performed on every subject.
Outcome measures:The TSNIT global average, superior and inferior average, and nerve fiber indicator (NFI) were noted.
Results: There was no significant difference in the mean age between the myopes and emmetropes. There was no statistically significant difference in the NFI and TSNIT values between emmetropes and low myopes. The TSNIT average, superior and inferior average was significantly lower (p=0.0097), while the NFI was higher (p < 0.0001) in moderate myopes as compared to emmetropes. In high myopia the RNLF showed supranormal values, the TSNIT average, superior and inferior average was significantly higher (p < 0.0001) as compared to emmetropes. (table 1)
Conclusion: The RNLF measurements on scanning laser polarimetry are affected by myopic refractive error. Moderate myopes show a significant thinning of the RNLF. In high myopia due to peripapillary chorioretinal atrophy and contribution of scleral birefringence, the RNLF thickness values are abnormally high. These findings need to be taken into account while assessing and monitoring glaucoma damage in moderate-high myopes on GDX VCC.
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P172 DIAGNOSTIC CAPABILITY OF GDX VCC IN EARLY GLAUCOMA
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Purpose: To evaluate the diagnostic ability of scanning laser polarimetry (GDX VCC) for early glaucoma in Asian Indian eyes.
Design: Cross-sectional observational study.
Participants and/or controls: Two groups of patients (early glaucoma and normal) who satisfied the inclusion and exclusion criteria were included. Early glaucoma was diagnosed in presence of open angles, characteristic glaucomatous optic disc changes correlating with the visual field on automated perimetry (visual field defect fulfilling at least two of three Anderson and Patella's criteria with mean deviation less negative than or equal to 6 db). Normals had visual acuity ≥ 20/30, intraocular pressure (IOP) < 22 mmHg with normal optic disc and fields and no ocular abnormality.
Methods: All patients underwent complete ophthalmic evaluation including visual field examination (24-2 / 30-2 sita standard program) and imaging with GDX VCC.
Main outcome measures: Sensitivity, specificity, positive (PPV) and Negative predictive values (NPV), area under receiving operating characteristic curve (AUROC) and likelihood ratios (LR) were calculated for various GDX VCC parameters.
Results: Seventy-four eyes (74 patients) with early glaucoma and 104 eyes (104 normals) were enrolled. NFI > 20 had a highest sensitivity of 90.5% (95% c.i: 87-93) followed by NFI> 30 with a sensitivity of 71.62% (95% c.i: 66.6-79.6). NFI > 50 had highest specificity of 99% (95% c.i: 98-100). TSNIT STD dev had the 'best combination' of sensitivity and specificity; 61.33% (95 % c.i.: 55.5 ' 66.8)

and 95.2% (95 % c.i.: 93.8 ' 96.7) respectively. Maximum PPV was for NFI > 50. At a prevalence level of 30%, likely in the clinics of those with an interest in glaucoma, a NFI score of > 50 had a PPV of 95.9 % and a NPV of 83%. At a presumed disease prevalence level of 5% if we target older population, the PPV and NPV were 74.3 % and 97.6 % respectively. A NFI score of > 50 had a positive likelihood ratio of 54.8 and negative likelihood ratio of 2.1. NFI score > 20 had the highest negative likelihood ratio of 5.6. The TSNIT STD dev had the highest AUROC (0.87, 95% c.i.: 0.81-0.93) followed by NFI score with an AUROC of (0.85, 95% c.i.: 0.78 - 0.91). TSNIT thickness parameter had AUROC of (0.83, 95% c.i.: 0.76 ' 0.89).

Conclusions: GDX VCC has moderate sensitivity with high specificity in the diagnosis of early glaucoma. The high positive likelihood ratio for the NFI score can provide valuable diagnostic information for individual patients.

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P173 EFFECT OF CHANGE IN MACULAR BIREFRINGENCE IMAGING PROTOCOL ON RNFL THICKNESS PARAMETER IN GDX VCC

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Objective: To study the effect of two different macular birefringence imaging protocols used for corneal compensation, on retinal nerve fiber thickness parameters using GDX VCC.

Design: Observational cross sectional study.

Participants: 46 eyes of 46 normal subjects (normal disc, normal visual fields and IOP <21mmHg).

Methods: All the subjects underwent a detailed clinical evaluation including slit lamp biomicroscopy with a 90d lens, applanation IOP and Humphrey 24-2 visual fields. Retinal nerve fibre layer thickness (RNLF) parameters were measured on GDX VCC. Compensation for corneal birefringence was done using the standard protocol (small circle) after imaging the macula (i) and then repeated using the irregular pattern (large square) protocol (ii) which is to be used in the presence of macular lesions. Only images with a quality score of > 8 were included.

Main outcome measures: The TSNIT average, superior average, inferior average and NFIi were evaluated. Agreement between the two methods of RNLF assessment was seen.

Results: The TSNIT average (µm) in the normal population 51.55 ± 4.36 and 52.64 ±5.08 (p=0.003), the superior average was 62.63 ± 6.52 and 65.71 ± 6.82 (p<0.001) and the inferior average was 58.57 ± 7.53 and 59.84 ± 6.61 (p=0.06) using type i and type ii imaging protocol respectively. The mean NFI was 22.72 ±9.72 and 19.48 ±8.67 (p< 0.001) in type i and type ii protocol respectively. There was a significant difference in all RNLF thickness values between the two scan protocols. Intraclass correlation coefficient (ICC) was low for all RNLF thickness parameters(0.57-0.85) except for NFI (0.91). The correlation coefficient (r) and regression coefficient (β) were also very low for all parameters except NFI (r=0.84, β=0.88).

Conclusions: The RNLF thickness values on GDX VCC change significantly in the normal population on changing the scan protocol for macular lesions. This is an important consideration for glaucoma patients with macular lesions who undergo corneal compensation using an alternate protocol and patients who develop a macular lesion during the course of their follow up using scanning laser polarimetry .

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P174 NORMAL DISTRIBUTION OF RETINAL NERVE FIBER LAYER THICKNESS AND OPTIC DISC DIAMETER IN INDIAN POPULATION ON THE SCANNING LASER POLARIMETRY (GDX VCC)

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Purpose: To quantitatively assess the normative data for disc diameters and nerve fiber layer measurements as obtained by scanning laser polarimetry with variable corneal compensation (GDXVCC).

Design: Observational cross sectional study.

Participants: Two hundred eyes of 200 normal subjects with normal visual fields (SITA standard 30-2), normal optic disc, IOP <21mmHg and a refractive error within ± 3 diopters.

Methods: The peripapillary retinal nerve fibre layer of 200 normal eyes was evaluated. Retinal nerve fibre layer thickness (RNLF) was measured by scanning laser polarimetry (GDX VCC) (Laser Diagnostic Technologies, San Diego, CA). Optic disc diameters were also taken from the GDX VCC image after centring the measurement ring well over the disc.

Main outcome measures: Parameters for evaluation included vertical and horizontal disc diameter, TSNIT average, superior average, inferior average and NFI.
Results: There were 125 males and 75 females. Mean age was 36.4 ±11.2 (range 20-72) years. The optic disc was vertically oval with vertical diameter more than horizontal diameter. Average horizontal and vertical disc diameter was 1744.11 ± 217 and 1850.43 ± 187 µm. The TSNIT average (µm) in the sample population was 53.88 ± 4.6 and NFI was 17.8 ± 7.1. The NFI value ranged from 2-35. The mean value of superior average and inferior average (µm) was 66.5±7.3 and 62.8±7.6. The inferior RNLF average was significantly thinner than superior RNLF average ($p<0.001$).
Conclusions: The normative database of RNLF thickness and disc size in Indian population on the GDX VCC is provided.
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P175 ASSESSMENT OF TEST RETEST VARIABILITY ON VARIOUS GDX VCC PARAMETERS IN NORMAL AND GLAUCOMATOUS EYES
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Objective: To evaluate the test retest variability of scanning laser polarimetry with variable corneal compensation (GDX VCC) parametrs in normals and glaucomatous eyes.
Design: Observational cross-sectional study.
Participants: This study included 30 eyes of 30 normal subjects (normal disc with normal visual fields), and 30 eyes with glaucoma (POAG, chronic PACG, NTG).
Methods: All patients underwent 30-2 SITA standard visual fields, slit lamp biomicroscopy, gonioscopy, applanation diurnal IOP recording and GDX VCC. The GDX VCC measurements were repeated thrice in each patient in both the groups at an interval of 5 minutes by the same operator.
Main outcome measures: The main outcome measures included TSNIT average, superior average (SA), inferior average (IA), TSNIT standard deviation (SD) and NFI. Intraclass correlation coefficient and intersession difference in µm was calculated separately for the two groups and for each parameter to assess the reproducibility.
Results: The TSNIT average (µm) in normal subjects in trial 1, 2 and 3 were 53.14 ± 4.54, 53.6 ± 4.60 and 53.38 ± 4.60 respectively. Similarly the NFI values in the 3 trials in normal population were 18.26 ± 6.28, 18.65 ± 6.34, 19.04 ± 6.87. All the parameters had good intraclass correlation coefficient suggesting good reproducibility by the instrument. Intraclass correlation coefficient ranged from 0.935 to 0.971 in healthy subjects and from 0.969 to 0.988 in glaucoma patients. Intersession difference in normal eyes in TSNIT (µm) ranged from 0.1-5.8 (mean 2.21 ± 1.18) with 40% eyes having difference of >3 µm and 5% eyes had difference of >5 µm. Intersession difference in NFI being 0-11 (mean 4.05 ± 2.46) and 50% had difference of >5 in normals. Intersession difference in glaucomatous eyes was higher with the value for TSNIT (µm) ranged from 0.1-9.6 (mean 2.62 ± 2.1) with 50% eyes having difference of >3 µm and 10% eyes had difference of >5 µm. Intersession difference in NFI being 0-14 (mean 6.03 ± 3.86) and 50% had difference of >5 and 20% had difference of >10.
Conclusions: GDX VCC has good test retest repeatability in normal and glaucomatous eyes. The intersession difference was larger in glaumatous eyes specially for NFI. This wide difference in NFI by GDX VCC measurements may preclude assessment of glaucomatous progression based on asseessment of NFI alone.
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6.9.2. Clinical examination methods: Computerized image analysis: Optical coherence tomography

P178 AGE-RELATED LOSSES OF RETINAL GANGLION CELLS AND AXONS.
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Purpose: Age-related losses in retinal nerve fiber layer thickness (RNLFt) are assumed be the result of an age dependent reduction of retinal ganglion cells (RGCS), but

the rates are much different; published age-related losses in RGCS are about 0.6%/year, compared to 0.2%/year for thinning of RNLFt. To determine whether the neural bases for these aging effects are equivalent, the aging effects on estimates of RGCS from standard automated perimetry (SAP) and estimates of RGC axons by optical coherence tomography (OCT) were compared. ***Design:*** Cross-sectional study.
Participants: Forty-two patients (ages 20 - 80 years, median = 44 years) with normal visual fields by SAP 24-2 testing.
Methods and Outcome measures: Using an adaptation of procedures that have been previously described for experimental glaucoma or normative clinical data, the SAP-measures of visual sensitivity and OCT measures of RNLFt were used to estimate neuron counts by each procedure.
Results: In agreement with published data, the age-related thinning of RNLFt was 0.2%/year for OCT mean thickness or when a constant axon density was used to derive axon counts at every age. In comparison, the age-related loss of RGCS from SAP measurements was 0.6%/year. Concordance between losses of axons and soma required an age-dependent reduction of 0.46%/year in the density of axons in the RNLFt.
Conclusions: The results suggest that the proportion of RNLFt that is comprised of RGC axons is not constant across age, but rather a greater proportion of the total thickness is non-neural tissue for older patients and, thus, the dynamic range of RNLFt thinning from glaucoma is smaller. The difference in RNLFt changes from aging and glaucoma may reflect a difference in the site (soma vs. Axon) of initial injury leading to cell death.
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P179 EVALUATION OF DISC AREA AND AXIAL LENGTH INFLUENCE ON RETINAL NERVE FIBER LAYER THICKNESS

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Purpose: Evaluation of influence of disk area and axial length on retinal nerve fiber layer thickness as measured on optical coherence tomography.
Design: A clinic-based non-randomised, non-interventional, cross-sectional, comparative study.
Participants: Fifteen normal subjects were enrolled from outpatient clinic.
Methods: Normal subjects had unaided visual acuity of 20/20 and no other ocular pathology. The disk area (DA) data was retreived from Heidelberg's Retinal Tomogram (HRT-I) and optical coherence tomography (OCT) was used for retinal nerve fiber layer thickness (RNLF). The axial length was measured using ultrasound a scan. RNLF measurements included the fast RNLF scan (at 3.4 mm) in each eye, RNLF measurements at the disc margin, RNLF at 1.2 mm, 1.5 mm around the disc margin and standard RNLF. The descriptive analysis of disk area and axial length; corelation of disk area, RNLF thickness at varying distances from disk margin and axial length was done.
Main outcome measures: Correlation of disk area, axial length and RNLF thickness at varying distances from disk margin.
Results: Mean age was 32±1.55 years. The mean disk area was 2.9 mm2 ±0.45 (2.2 mm^2 - 3.64 mm^2). The average difference of RNLF thickness at disc margin and fast RNLF protocol was 13.7 microns (-10.96 to 43.18). Disk area and axial length showed a highly significant (p=0) positive correlation (r=0.979). There was a significant (p=0.049) negative correlation(r=-0.535) between axial length and fast RNLF thickness. RNLF at disk margin had no significant correlation with disk area, axial length and RNLF thickness with 3.4 mm circle.
Conclusions: For a fixed diameter circle RNLF, RNLF thickness has a significant negative correlation with axial length. The RNLF thickness at disc margin was unaffected with varying disc sizes and axial length and so were the scan protocols with circle diameters of 2.4, 3, 3.4 mm. This might indicate that these protocols might give us RNLF thickness, which is independent of disk size/ axial length unlike fast RNLF thickness (3.4 mm) on OCT.
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P180 TEST RETEST VARIABILITY OF RNFL THICKNESS MEASUREMENTS WITH STRATUS OCT IN NORMAL AND GLAUCOMATOUS SUBJECTS

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Objective: To evaluate the test re-test variability of the retinal nerve fibre layer (RNLF) thickness in normal and glaucomatous subjects as measured by stratus OCT.

Design: Cross-sectional study.
Participants and controls: Twenty-one subjects (14 normal, 7 glaucomatous) were recruited for the study.
Intervention: RNLF scanning with stratus OCT. Measurements were acquired by two operators in two visits within 3 months. The fast RNLF 3.4 and standard RNLF 3.4 protocols were used. On the first session scanning followed the sequence: operator 1 (7 fast + 3 standard scans) operator 2 (3 fast + 3 standard) operator 1 (3 fast + 3 standard). On the second visit the sequence was operator 1 (3 fast + 3 standard) operator 2 (7 fast + 3 standard). On the first visit the scanning circle was centred on the optic disc with the landmark placed on the temporal edge of the disc. On all subsequent scans the repeat function was used by both operators.
Main outcome measures: RNLF thickness.
Results: Of 21 subjects, 2 were unable to complete the study through unavailability or poor scan quality. Four normal subjects were excluded from analysis due to poor algorithm confidence (<7) in some scans. 9 normal subjects and 6 glaucomatous subjects were included for analysis. Subject age (years): normal, mean 67 (range 50-80), glaucoma, mean 73 (range 67-81). RNLF thickness (microns): normal = mean 97.6 (76.88 to 117.56), glaucoma = mean 63.9 (43.36 to 84.95). Visual field md (DB): normal = mean 0.46 (-1.00 to 2.75), glaucoma = mean3.57 (-12.44 to1.02).
Conclusions: Mean differences were low across visits and operators. There were no significant differences in variability between normal or glaucomatous subjects. The limits of agreement appear to be narrower in the glaucomatous group with the 'standard' acquisition protocol. The higher scan density may reduce variability with a thinner RNLF.
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P181 INFUENCE OF OPTIC DISC SIZE ON RNFL THICKNESS ON OCT AND HRT AMONG SUBJECTS WITH OCULAR HYPERTENSION AND GLAUCOMA

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Aim: To determine the influence of optic disc size with retinal nerve fiber layer (RNLF) thickness on optical coherence tomography (OCT) and heidelberg retina tomogram (HRT) in ocular hypertensive(OHT) and glaucomatous eyes.
Material and Methods: Two hundred thirty-six eyes were studied (108 OHT and 128 glaucoma). Eyes were categorized as OHT or glaucoma depending on the visual fields(HVF 24-2 sita STD). OHT included eyes with IOP more than 22 mmHg with normal visual fields while eyes showing glaucomatous visual field damage with or without raised IOP were included in the glaucoma group. Disc area as measured by HRT was correlated with RNLF parameters on OCT (average thickness, superior max, inferior max, superior average and inferior average) and HRT (mean RNLF thickness and RNLF cross sectional area). Eyes were divided into 4 groups depending on the disc size and the RNLF parameters were analyzed accordingly.
Results: The mean age was 51.92 ± 14.21 and 52.71 ± 11.1 in OHT and glaucoma group respectively. The average disc size for OHT was 2.40 ± 0.52(1.16-3.54) mm2 and for glaucoma was 2.53 ± 0.62(1.30-4.42) mm2. Mean of average thickness was 90.15 ± 19.95 um, mean RNLF thickness was 0.201 ± 0.08 mm and mean cross sectional RNLF 1.16 ± 0.47 mm^2 in glaucomatous eyes. There was significant positive correlation between disc area and mean cross sectional RNLF thickness in this group (r = 0.205, P = 0.020). In the OHT group, the mean of mean average thickness was 97.14 ± 14.90 um, mean RNLF thickness was 0.223 ± 0.06 and mean cross sectional RNLF thickness was 1.22 ± 0.488 mm^2. The cross-sectional RNLF thickness showed a significant increase in thickness with disc area (p =0.0001). There was good correlation between disc area and the average thickness (OCT) and mean cross sectional RNLF thickness (HRT) in the OHT eyes(r = 0.205, p= 0.03 and r = 0.392,p= 0.0001 respectively).
Conclusion: RNLF thickness measured by both OCT and HRT increases with increase in the optic disc size in OHT. Size of the optic disc could potentially influence comparison with normative NFL data on OCT.
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P182 MEASUREMENT OF RETINAL NERVE FIBER LAYER THICKNESS IN APPARENT NORMAL HEMI-FIELDS OF VISUAL FIELDS

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Purpose: To study retinal nerve fiber layer (RNLF) thickness in the unaffected visual hemifields of patients with early glaucoma.
Design: Cross-sectional study.
Participants and/or controls: Patients with early glaucoma (with visual field defects in only one hemifield) and normals were included. Early glaucoma was diagnosed in presence of open angles, characteristic glaucomatous optic disc changes correlating with the visual field (defect fulfilling at least two Anderson and Patella's criteria with mean deviation ³6 db). Normal's had visual acuity ≥ 20/30, intraocular pressure < 22 mmHg with normal optic disc and fields and no ocular abnormality.

Methods: Complete ophthalmic evaluation was performed including automated perimetry and imaging with stratus OCT 3.
Main outcome measures: Paired and unpaired 't' tests were used to compare RNLFt between unaffected and affected retinal hemifields of glaucoma and between affected and unaffected retinal hemifields of glaucoma with corresponding retinal hemifields of normals.
Results: Fifty-seven early glaucoma subjects (38 with superior and 19 with inferior visual hemifield defects) and 77 age-matched normal's were analysed. In patients with superior visual hemifield defect, with OCT 3, average inferior and superior peripapillary RNLFt were 95.3 m and 111.8 m respectively ($p < 0.0001$). RNLFt difference between unaffected visual hemifield and corresponding visual hemifield of normals was not significant. In patients with inferior visual hemifield defect, with OCT 3, average inferior and superior peripapillary RNLFt were 119.7 m and 88 m respectively ($p = 0.1$). RNLF difference between unaffected visual hemifield and corresponding visual hemifield of normals was statistically significant ($p < 0.001$). Results with macular RNLF thickness (OCT) were similar.
Conclusions: Patients with superior hemifield defect had RNLF thinning localized to inferior retinal hemifield while patients with inferior field defect had RNLF thinning in both retinal hemifields.
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6.9.2.1. Clinical examination methods: Computerized image analysis: Optical coherence tomography: Anterior

P183 EVALUATION BY SLITLAMP-ADAPTED OPTICAL COHERENCE TOMOGRAPHY OF THE FILTERING FUNCTION OF THE BLEB REMAINING AFTER TRABECULECTOMY

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Purpose: To evaluate by slitlamp-adapted optical coherence tomography (SL-OCT) the filtering function of the bleb remaining after trabeculectomy.
Methods: Thirteen patients who each underwent trabeculectomy with a fornix-based conjunctival incision in one eye were included in the study. The appearance of the bleb as revealed with a slitlamp and its internal structure as revealed by SL-OCT were evaluated 1 day, 1 week, and 1 month after surgery. The relation between intraocular pressure (IOP) measured 1 month after surgery and either the appearance or internal structure of the bleb was examined.
Results: Trabeculectomy was successful in seven patients, in that IOP was <11 mmHg at 1 month after surgery, and it was unsuccessful in six patients (IOP of ≥11 mmHg). The appearance of the bleb was flat in four cases and diffuse in nine cases 1 month after surgery. There was no significant difference in the appearance of the bleb between the successful and unsuccessful treatment groups. The subconjunctival space was located mostly between the posterior edge of the scleral flap and the limbus in all patients of the unsuccessful treatment group but in only two patients of the successful treatment group 1 month after surgery, with this difference being statistically significant ($p < 0.05$). A relation between IOP and other aspects of the internal structure of the bleb was not apparent.
Conclusions: These results indicate that the localization of the subconjunctival space after trabeculectomy reflects the filtering function of the bleb. They therefore suggest that aqueous fluid should be drained more posteriorly in order to obtain an adequate reduction in IOP.
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P184 COMPARISON OF GONIOSCOPY AND ANTERIOR SEGMENT OCT IN DETECTING ANGLE CLOSURE IN DIFFERENT QUADRANTS OF THE EYE

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Purpose: To compare the performance of gonioscopy and anterior-segment OCT (AS-OCT) in detecting angle closure in different quadrants of the eye.
Design: Cross-sectional observational study.
Participants: Five hundred two consecutive subjects over the age of 50 with no previous ophthalmic problems recruited from a community clinic in Singapore.
Methods: All subjects underwent gonioscopy and AS-OCT imaging in the dark. Using gonioscopy the anterior chamber angle (ACA) was graded using a modified Shaffer classification by a single examiner masked to AS-OCT findings.
Main outcome measures: The ACA in a particular quad-

rant 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.
Results: After excluding eyes with poor image quality, a total of 423 right eyes were included in the analysis. A closed angle in at least one quadrant was observed in 59% of the eyes by AS-OCT, and in 33% of the eyes by gonioscopy ($p<0.001$), with fair agreement between the two methods (kappa=0.40). The frequency of closed angles by AS-OCT and gonioscopy were 48% vs 29% superiorly, 43% vs 22% inferiorly, 18% vs 14% nasally, 12% vs 20% temporally, respectively. Among 119/1692 quadrants that were closed on gonioscopy but open on AS-OCT, an steep iris profile on AS-OCT was present in 61 (51%) quadrants. Of the 276/1692 quadrants that were open on gonioscopy but closed on AS-OCT, 196 (71%) quadrants showed short irido-angle contact on AS-OCT.
Conclusion: The highest rates of closed angles on gonioscopy and AS-OCT images were observed in the superior quadrant. AS-OCT tended to detect more closed acas than gonioscopy, particularly in the superior/inferior quadrants. Particularities in the methods of assessing/interpreting the aca configuration of each technique may account for some of these discrepancies. Prospective studies will be required to determine the clinical importance of these differences.
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P185 PHYSIOLOGICAL CHANGES OF THE ANTERIOR CHAMBER ANGLE WITH ANTERIOR SEGMENT OCT
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Objective: To examine the physiological changes of the anterior chamber angle in Caucasian eyes using optical coherence tomography (OCT).
Design: Observational cross-sectional study.
Participants: One hundred six Caucasian patients from a prospective database consisting of new patients attending a private ophthalmic practice in Melbourne, Australia.
Method: The Zeiss visante - anterior segment OCT imaging system was used to study the profile of the anterior chamber angle. OCT images of both eyes were taken prior to the eye being examined and gonioscopy being performed. Images of all 4 quadrants were taken in light and dark conditions. The images of the right eye were examined between different age groups, different lighting conditions and between normal and ocular hypertensive / glaucoma patients.
Main outcome measures: Changes of the iris profile and the presence of iridotrabecular touch.
Results: In the 1-30 year old age group, the iris plane is usually flat and posterior to the scleral spur. Occasionally, posterior bowing of the iris is seen. In the 61-70 year old age group, the iris plane is usually curved forward and anterior to the scleral spur. Compared to the angle in the light, the pupil is dilated in the dark and the iris plane is more anterior due to pupil block and thickening of the peripheral iris adjacent to the drainage wall. When the iris plane is at the level or anterior to the scleral spur, there is narrowing or loss of the angle recess (with the iris touching the scleral spur, trabecular meshwork and Schwalbe's line in many cases). Iridotrabecular contact was common in the 61-70 year old age group and in ocular hypertensive / glaucoma patients.
Conclusion: In older patients, the iris plane is usually anterior to the scleral spur. When the pupil dilates, there is peripheral iris thickening, anterior movement of the iris and narrowing or loss of the angle recess. The height of the iris plane relative to the trabecular meshwork determines the risk of iridotrabecular contact.
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P186 MORPHOLOGIC CHANGES IN ANTERIOR SEGMENT AFTER LASER PERIPHERAL IRIDOTOMY IN PRIMARY ANGLE CLOSURE
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Purpose: To observe the impact of laser peripheral iridotomy on the morphology of anterior segment in primary angle closure (PAC) eyes.
Design: Non-randomized clinical trial, self-controlled study.
Participants: Fifteen consecutive PAC patients (15 eyes) aged 55 to 74 years were enrolled in this study. The diagnosis of PAC was according to the classification by foster in 2002.
Methods: Anterior chamber optical coherence tomography (AC-OCT) was performed to record the images of anterior segment on all enrolled eyes, and Goldmann tonometry was used to measure the intraocular pressure (IOP) immediately after AC-OCT examination. After all enrolled eyes underwent laser peripheral iridotomy (LPI), the AC-OCT examination and IOP measurement were repeated. Images of anterior segment were stored and parameters were measured by internal software. The topical and systemic anti-glaucoma drugs were restricted to avoid the potential influence on the morphology of anterior segment. The illumination and accommodation were strictly controlled.

Main outcome measures: Central anterior chamber depth (CACD), pupil diameter (PD), lens thickness (LT), anterior chamber volume (ACV) and intraocular pressure (IOP) were recorded. Peripheral anterior chamber depth (pacd) and configuration of iris were also observed qualitatively.
Results: The mean following days was 20.2±12.7 days (range: 7-48days). The mean CACD was 1.939±0.228 mm and 1.970±0.235 mm before and after LPI respectively, increasing by 1.6% (p=0.001). The CACD of all eyes but two got increased. The ACV was 73.86±14.58 µl and 84.14±17.45 µl before and after LPI respectively, increasing by 13.9% (p<0.001). The ACV increased in all studying eyes. In qualitative analysis, the iris flattened and the PACD deepened after lpi in all 15 eyes. Statistically significant change was also found in IOP after LPI (17.8±3.3 mmHg vs.15.9±3.1 mmHg, p=0.042). The changes of PD and LT were not statistically significant (p=0.286 and p=0.198 respectively).
Conclusions: LPI could not only increase the peripheral anterior chamber depth and the anterior chamber volume, but also increase the central anterior chamber depth in primary angle closure eyes.
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P187 CORRELATION BETWEEN IN VIVO CONFOCAL MICROSCOPY AND ANTERIOR SEGMENT OCT IN FILTERING BLEBS ANALYSIS
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Objective: To correlate anterior chamber OCT (AC-OCT) and in vivo confocal microscopy (IVCM) images of blebs after deep sclerectomy.
Design: Observational case series.
Participants: We retrospectively evaluated 15 filtering blebs of 15 patients after deep sclerectomy.
Methods: Ophtalmologic examinations included slit-lamp examination, applanation tonometry, IVCM and AC-OCT analysis. Eyes were classified into three groups: functioning blebs (5 eyes), non functioning blebs (5 eyes) and functioning blebs after application of mitomycin c (5 eyes).
Main outcome measures: Cellular patterns (IVCM), morphologic appearance (AC-OCT) and functional aspects were correlated.
Results: Functioning blebs had numerous intraepithelial microcysts and a widely spaced subepithelial connective tissue corresponding to the presence of sub conjunctival fluid collection and hyporeflective blebs on AC-OCT images. Non-functioning blebs had none or few intraepithelial microcysts with a dense subepithelial connective tissue corresponding to the hyperreflective blebs observed with AC-OCT. Functioning blebs with mitomycin c had numerous microcysts and loosely arranged subepithelial connective tissue corresponding to the large hyporeflective blebs with multiple fluid collections covered by a thin layer of conjunctiva observed with AC-OCT.
Conclusion: IVCM findings were well correlated with AC-OCT images. The resolution of IVCM was higher than that of AC-OCT to analyse the bleb wall, but AC-OCT could provide internal bleb morphology. Combining both techniques would be useful to study the surgical outcomes and the wound healing process after filtering surgery.
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P188 SLIT LAMP ADAPTED OPTICAL COHERENCE TOMOGRAPHY GUIDED INTERVENTION FOR RESTORATION OF BLEB FUNCTION POST-TRABECULECTOMY
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Objective: To report the use of anterior segment slit lamp adapted optical coherence tomography (SL-OCT) guided needling for failing filtering blebs post-trabeculectomy.
Design: Prospective interventional case series.
Participants: Five eyes of 5 patients with operated trabeculectomy with a failing / encysted bleb and raised IOP (> 25 mmHg) were included.
Intervention: A 26-gauge needle was introduced under the conjunctival into the dysfunctional bleb and fibrotic tissue excised under direct visual control as monitored from the SL-OCT. Sub-conjunctival injection of 5-flurouracil (5 mg) was performed at the end of the needling.
Outcome measures: Bleb morphology on SL-OCT and IOP were recorded in the immediate post-operative period and at 1 week.
Results: All eyes had restoration of bleb function with IOPs < 16 mmHg and a diffuse elevated bleb with increased echogenecity noted on SL-OCT imaging.
Conclusion: SL-OCT guided bleb revision is a useful technique for restoration of bleb function that allows precise anatomical localization of bleb pathology and in vivo imaging of the effect of needling on bleb function.
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P189 EFFECT OF SLIT-LAMP ILLUMINATION ON ANTERIOR CHAMBER ANGLE WIDTH USING SLIT LAMP ADAPTED ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY (SL-OCT)

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Objective: To assess the anterior chamber angle changes induced by slit lamp illumination using slit lamp adapted anterior segment optical coherence tomography (SL-OCT).
Design: Cross-sectional observational study.
Participants: Thirty eyes of 30 normal emmetropic subjects with normal pupillary reaction and not on any systemic or topical medication were evaluated.
Methods: The superior angle measurements were recorded using SL-OCT (Heidelberg Engineering Inc, Germany) under 3 different slit lamp lighting conditions with similar room illumination. A) no slit lamp illumination .b) small slit (4 x 2 mm) ' at the superior angle, not crossing pupil c) large slit (10 x 2 mm) crossing the pupil. Three images of the superior angle were stored and all the measurements were performed by a separate operator, masked to the study design.
Outcome measures: Anterior chamber trabecular iris angle (TIA), and angle opening distance (AOD) at 500 µm from the scleral spur were measured.
Results: The mean values for TIA in degrees were a: 30 o ± 10.4, b: 36.2 o ± 10.4, c: 38.5o ±12.8 respectively and for AOD 500 in mm were a: 0.411 ± 0.15, b: 0.493 ± 0.16, c: 0.550 ± 0.15. (table 1). There was a significant widening of the anterior chamber angle from baseline when a small slit was used, which further increased on use of a larger slit beam.
Conclusions: Use of slit lamp illumination induces significant changes in the anterior chamber angle width. This has implications for angle evaluation as performed by gonioscopy on the slit lamp. The non contact goniometric evaluation by the SL-OCT may be the preferred technique for assessment of the angle while screening for primary angle closure.
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P190 DYNAMIC ANALYSIS OF DARK-LIGHT CHANGES OF THE ANTERIOR CHAMBER ANGLE WITH ANTERIOR SEGMENT OCT

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Purpose: To describe the use of anterior segment optical coherence tomography (OCT) in studying the dynamic dark-light changes of the anterior chamber angle.
Design: Cross-sectional study.
Participants: Thirty-seven normal subjects with open angles on dark room gonioscopy and 18 subjects with narrow angles were analyzed.
Methods: The dynamic dark-light changes of the anterior chamber angle were captured with real-time video recording. The angle opening distance (aod 500) of the nasal angle and the pupil diameter in each of the representative serial images were measured. Linear regression analysis was performed to investigate the association between aod 500 and pupil diameter. Demographic and biometry measurements associated with the aod difference (AOD 500 (light) - AOD 500 (dark)) were analyzed with univariate and multivariate regression models.
Main outcome measures: Changes in angle opening distance.
Results: The AOD 500 measured in the light in the open angle and the narrow angle groups were 689 ± 334 micrometer and 265 ± 78 micrometer, respectively. These values were significantly greater than the aod 500 measured in the dark (488 ± 269 micrometer and 119 ± 82 micrometer, respectively, $p<0.001$ for both). The range of the aod difference (aod 500 (light) - AOD 500 (dark)) was 13 micrometer to 817 micrometer, with an average of 180 micrometer. Multivariate regression analysis identified a positive correlation between anterior chamber depth and aod difference after adjusting for age. Forty-seven eyes showed a high correlation between aod and pupil diameter (correlation coefficient ranged between 0.73 and 0.99, median =0.93) whereas four eyes showed no association. Four eyes in the narrow angle group developed appositional angle closure in the dark.
Conclusions: The dynamic dark-light changes of the anterior chamber angle can be imaged and analyzed with anterior segment oct. While the angle width generally decreased linearly with increasing pupil diameter, the differences of the angle width measured in the dark and in the light vary substantially among individuals. Our findings demonstrate the importance of standardizing the background light intensity when evaluating the configuration of the anterior chamber angle.
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P191 COMPARISON OF ANTERIOR CHAMBER MORPHOLOGY BETWEEN FELLOW EYES OF ACUTE PRIMARY ANGLE CLOSURE GLAUCOMA (APACG) AND NORMAL WITH SHALLOW ANTERIOR CHAMBER DEPTH(ACD)

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Objective: Comparison of anterior chamber morphology between fellow eyes of APACG and normal with shallow ACD, so as to find the key factors in attack of APACG and to define cutoff values for occludable angle (OA).
Design: Non-randomized case control study.
Participants and controls: 45 fellow eyes of APACG and 43 control eyes with ACD less or equal to 2.1 mm.
Methods: We selected 45 participants in sequence with one eye APACG attacking in clinic of Beijing Tongren hospital. Include criteria: no APACG attacking, optic nerve and visual field normal, no other anterior segment disease, and excluding secondary glaucoma. The 43 controls were from the beijing eye study with acd less or equal to 2.1 mm, whose gender and agegroup matched with participants, but no glaucoma for both eyes, excluding anterior segment disease or surgery. Both underwent a complete eye examination. Slit lamp adapted optical coherence tomography (SL-OCT) was used to take photos of anterior chamber. ACD, anterior chamber angle (ACA) and angle open distance at 500 microm (AOD500) for four quadrants was measured using a software program in the apparatus itself. For statistics analyzing, we use roc curve, discriminant analysis and chi-square test, ($p<0.01$ has significance).
Main outcome measures: ACD (corneal endothelial surface to anterior lens surface), ACA (scleral spur as APEX of the angle, one boundary was on corneoscleral wall 500 microm anterior to it, the other was on iris surface 500 microm from it) and AOD500 (from one point on corneoscleral wall 500 microm anterior to scleral spur did an vertical line across iris surface, and the distance between them).
Results: The area of ACD, ACAmean and AOD500mean (mean for four quadrants) are 0.699, 0.828 and 0.833. From discriminant analysis we could conclude the formula y=0 .559ACAN+0.559ACAT+0.487ACD and 80.7% of original grouped cases correctly classified when analyzing four quadrants ACA. If four quadrants' ACA and AOD500 were analyzed, and then y=0.576AODN+0.523ACAT+0.466ACD and 81.8% correctly classified. According to Shaffer ≤1 (ACA ≤ 10 degree) define narrow angle, narrow angle ≥1 quadrants, or 20 degree (Shaffer ≤2) as cutoff value for narrow angle, narrow angle ≥2 quadrants define OA, chi-square test had significance($p=0.003$ and 0.002 respectively).
Conclusions: ACA and AOD500 are good predictions for detection APACG angle risk factors in shallow ACD persons. According to Shaffer system ≤1 and ≥1 quadrants or Shaffer system ≤2 and ≥2 quadrants define OA are more scientific in our study. Nasal anterior chamber angle is more pivotal in the attack of APACG than other three quadrants.
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P192 ANTERIOR CHAMBER DEPTH AND ANTERIOR CHAMBER ANGLE AS MEASURED BY OPTICAL COHERENCE TOMOGRAPHY (OCT) IN ADULT CHINESE AND THEIR ASSOCIATIONS WITH OCULAR AND GENERAL PARAMETERS. THE BEIJING EYE STUDY

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Objective: To investigate the normal variation of anterior chamber depth (ACD) and anterior chamber angle (ACA), and their relationships with ocular and general parameters, including age, gender, refractive error, body height and body weight in adult Chinese.
Design: Population-based cross-sectional study.
Participants: 3251 adult Chinese aged 45 to 89 years (3251 eyes) attended the 5-year follow-up study of the Beijing Eye Study.
Methods: They underwent a basic medical examination such as body weight , body height and questionnaire for disease history and a complete eye examination, including visual acuity, autorefractometer, slit lamp biomicroscopy, intraocular pressure with noncontact tomography, slit lamp adapted optical coherence tomography(SL-OCT), visual field and optic disc photography. We use SL-OCT to take photos of anterior chamber (all right eyes were selected). ACD and ACA were measured using a software program in the apparatus itself. And nasal (ACAN) and temporal (ACAT) angles were measured because just take the horizontal photos.
Main outcome measures: ACD (corneal endothelial surface to anterior lens surface), ACA (scleral spur as APEX of the angle, one boundary was on corneoscleral wall 500microm anterior to it, the other was on iris surface 500microm from it), and refractive errors (expressed as spherical equivalents, SER: hypermetropia as mean SER > 1.00 diopter, myopia as mean SER <1.00 diopters, and emmetropia as mean SER < or = 1.00 diopters and > or =1.00 diopters, inclusive).
Results: After excluding eye with IOL implantations, glaucoma , unclear photos, without photos, anterior segment diseases, there were 2893 (89.0%) analyzed. The ACD and ACAmean (the average of ACAT and ACAN) were 2.43±0.33mm and 38.5±16.1 degree on average. People aged 45 to 55 years, when compared with those more than 75, had deeper ACDS (+0.25 mm) and wider acas (+9.5 degree). After controlling for age, women had shallower

ACDS, narrower acas than men. The variation in ACD and ACA with refractive errors was linear.
Conclusions: Both ACD and ACA have no relationships with area (urban and rural). Shallowing of ACD and narrowing of ACA in adult Chinese is associated with older age, female, hypermetropia, shorter in body height and thinner in body weight. It is joyful if this could provide some help in confirm population with high risk to develop angle-closure glaucoma in adult Chinese.
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P193 A PROSPECTIVE OPTICAL COHERENCE TOMOGRAPHY EVALUATION OF ANTERIOR CHAMBER DIMENSIONS BEFORE AND AFTER LASER IRIDOTOMY IN EUROPEAN EYES
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Purpose: The aim of this study was to quantify changes in anterior chamber dimensions by optical coherence tomography (OCT) after nd:yag laser iridotomy (LPI) in european patients with primary angle closure glaucoma (PACG).
Patients and Methods: Twenty eyes of 14 consecutive patients presenting a PACG at our clinic were examined with OCT at presentation, and one week after a nd:yag laser peripheral iridotomy. Average age of patients was 62.0 ± 16.6 (sd) years. Eight patients were females. The mean central anterior chamber depth (ACD) and the trabecular-iris angle (TIA) were measured with OCT. Baseline measurements were made under dim light conditions. All acd measurements were made vertically and horizontally using the inbuilt software and the mean of both ACD measurements was used for the analysis. All TIA measurements were done in the superior, nasal, inferior, and temporal quadrants.
Main outcome measures: TIA and ACD.
Results: The mean ACD increased insignificantly from 1.85 ± 0.39 to 1.86 ± 0.28 after LPI. The measured average angle was 9.36 ± 2.8 degrees before and 15.19 ± 4.4 degrees after LPI, showing a significant increase in angle dimensions (p = 0.00022).
Conclusions: LPI lead to a significant widening of the anterior chamber angle. However, there was no change in the mean anterior chamber depth before and after LPI. OCT examination is a viable and non-invasive tool for quantitative visualization of the anterior chamber.
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P194 THE APPLICATION OF VISANTE ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IN HEALTHY SOUTHERN CHINESE OVER 50 YEARS OF AGE: A PRELIMINARY STUDY
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Objective: To describe the use of the visante anterior segment optical coherence tomography (OCT) in imaging the anterior segment parameters of healthy southern Chinese over 50 years of age.
Design: Cross-sectional study.
Participants: Three hundred ninety-six healthy persons in southern China country over 50 years old were recruited in this study. The subjects in the age groups of 50s, 60s, 70s, 80s were 167, 108, 109, 12 respectively. Both eyes (if eligible) of each subject were included in the study. Exclusion criteria were hypermyopia, hypopia, uveitis, or previous ophthalmic surgery.
Methods: A commercial 1310-nm infrared light visante anterior OCT system was used for anterior segment evaluation. 792 eyes of 396 subjects were enrolled in the study. Both eyes in each patient were examined. The images were then analyzed by the built-in software.
Main outcome measures: CCT (central corneal thickness), ACD (anterior chamber depth), LT (lens thickness).
Results: Average age of the participants was (63±9)years old (50~86). The average CCT, ACD and LT was 0.510±0.03 μm, 2.56±0.30 mm and 4.74±0.33 mm respectively. There were no significant differences in image measurements between the right and the left eyes. ACD decreases with age (r =-0.182, p=0.00). LT increases with age (r =0.343, p=0.000). There was no difference in CCT among different age groups. There was strong association between LT and ACD (r =-0.555, p=0.000).
Conclusions: Visante anterior OCT is a new alternative for the anterior segment measurements. Compared with UBM, OCT provides a non-contact approach and it requires no coupling medium or supine positioning. The position and orientation of the scan can be localized and visualized from the real-time camera panel. OCT also provides higher axial resolution images (18μm in visante versus 25 μm in UBM). In our study, lt grows with aging, ACD decreases with aging, and with the increase of lt, the ACD decreases, the CCT has no difference among different age groups.
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P195 A PROSPECTIVE COMPARISON OF ULTRASOUND BIOMICROSCOPY AND OPTICAL COHERENCE TOMOGRAPHY FOR EVALUATION OF ANTERIOR CHAMBER DIMENSIONS IN EUROPEAN EYES

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Purpose: The aim of this study is to compare the accuracy in measurement of the anterior chamber angle by anterior segment optical coherence tomography (OCT) compared to ultrasound biomicroscopy (UBM) in European patients.
Patients and Methods: Fifty-five eyes of 33 consecutive patients presenting narrow angles or PAC at our clinic were examined at presentation with OCT, followed immediately by UBM. Average age of patients was 56.9 ± 16.1 (SD) years. Twenty patients were females. The trabecular-iris angle (TIA) was measured in the superior, nasal, inferior, and temporal quadrants. Baseline measurements were made under dim light conditions.

Main outcome measures: OCT and UBM measurements of the trabecular-iris angle (TIA).
Results: All measurements were made in the four quadrants. The mean superior TIA was 15.22 ± 11.64° in OCT and 11.26 ± 11.06° in UBM (p = 0.096), nasal TIA was 18.06 ± 12.65° (OCT) and 14.53 ± 9.86° (UBM) (p = 0.14), inferior TIA was 16.25 ± 11.15° (OCT) and 12.53 ± 8.24° (UBM) (p = 0.077), and temporal TIA was 16.36 ± 11.68° (OCT) and 14.51 ± 10.31° (UBM) (p = 0.428).
Conclusions: Our comparative study shows good correlation between UBM and OCT for the quantitative assessment of the anterior chamber angle. OCT examination is a viable and non-invasive tool for evaluation of the anterior chamber angle.
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P196 COMPARISON OF SLIT LAMP ADAPTED ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY (SL-OCT) AND ULTRASOUND BIOMICROSCOPY (UBM) FOR ASSESSMENT OF ANTERIOR SEGMENT

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Objective: To compare the anterior segment parameters using slit lamp adapted anterior segment optical coherence tomography (SL-OCT) and ultrasound biomicroscopy (UBM).
Design: Cross-sectional observational study.
Participants: Twenty eyes of 20 normal emmetropic subjects with normal pupillary reaction were evaluated.
Methods: Twenty eyes of 20 subjects underwent anterior segment evaluation by SL-OCT (Heidelberg Engineering inc, Germany), and UBM (paradigm). Central corneal thickness (CCT), anterior chamber depth (ACD), and the peripheral irido-corneal angles (superior and inferior) were assessed and compared.
Main outcome measure: Angle opening distance 500 microns at superior and inferior angles (AOD 500 sup. and inf), trabecular iris angle (sup. and inf), anterior chamber depth (ACD) and central corneal thickness (CCT).
Results: There was good correlation between SL-OCTand UBM measurements; r = 0.51 for AOD 500 superior angle (p< 0.01), r = 0.49 for AOD 500 inferior angle (p< 0.012), r = 0.83 for TIA superior(p < 0.0001), r = 0.64 for TIA inferior (p < 0.001), r = 0.85 for ACD (p<0.0001) and r = 0.44 for CCT (p< 0.03) (table 1). The ciliary body could only be clearly imaged on the UBM.
Conclusion: There is a good correlation between sl-oct and UBM for anterior segment measurements. SL-OCT has the advantage of being a non contact method, takes less time and allows imaging in a sitting position. UBM provides a better image of the ciliary body.
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P197 MORPHOLOGIC AND FUNCTIONAL ANALYSIS OF FILTERING BLEBS BY ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

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Objective: To analyze bleb structure after filtering surgery using the anterior segment optical coherence tomograph (AS-OCT) and to compare the results with clinical findings and long-term success rates of glaucoma surgery.
Methods: We retrospectively evaluated 113 filtering blebs of 87 patients following trabeculectomy. Ophthalmologic examinations included slit-lamp examination, applanation tonometry and AC-OCT. Eyes were classified into three groups. Morphologic appearance and functional of filtering and non-filtering blebs were compared in a masked manner.
Results: Only in 36% of filtering blebs were correlated morphologic appearance and bleb function, these eyes had a mean IOP 14mmHg (range 8-18 mmHg) without medication.
Conclusion: Examination by ACcOCT offers additional information about postoperative bleb function.
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P198 DETERMINATION OF CENTRAL CORNEAL THICKNESS AND ANTERIOR CHAMBER DEPTH MEASUREMENTS BY SL-OCT AND VISANTE ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY

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Purpose: To compare central corneal thickness (CCT) and anterior chamber depth (ACD) measurements taken with two commercially-available anterior segment optical coherence tomography (AS-OCT) systems: Slit lamp-OCT (SL-OCT) (Heidelberg Engineering, Dossenheim, Germany) and Visante OCT (Carl Zeiss, meditec, Dublin, CA).
Design: Prospective case series.
Participants: Twenty-four eyes of fourteen patients with primary angle closure were assessed with SL-OCT and Visante to record central corneal thickness and anterior chamber depth in standardized lighting conditions.
Methods: Two sets of readings were taken by a single observer for each system and the average of the two readings was used for statistical analysis. All readings were then repeated by a second observer. Inter- and intraobserver agreement of measurements was compared.
Main outcome measures: Assessment of agreement between devices and observers were carried out using Bland-Altman analysis.
Results: The mean ACD measurement was comparable for both systems, it was 2.16 mm (standard deviation [SD] 0.56) for SL-OCT and 2.24 mm (SD 0.55) for Visante. The average difference between SL-OCT and Visante values for ACD was -0.023 mm (95% confidence interval [CI], -0.050 to 0.005). The mean CCT for SL-OCT was 545.2 microns (SD 30.6) and 547.9 microns (SD 31.2) for Visante. The mean difference between the two readings was -2.75 microns (95% CI, -6.6 to 1.1). All inter- and intra-observer variation fell within 2 standard deviations of the mean.
Conclusions: Both ACD and CCT obtained by SL-OCT and Visante showed good agreement and may be used interchangeably in a clinical setting.

P199 ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IMAGING OF TRABECULECTOMY BLEBS BEFORE AND AFTER LASER SUTURE LYSIS

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Purpose: To image trabeculectomy blebs before and after laser suture lysis (LSL) using anterior segment optical coherence tomography (AS-OCT).
Methods: This was a prospective observational study of 7 patients who underwent LSL. All blebs were imaged with a prototype of the AS-OCT (Carl Zeiss Meditec Inc, Dublin, CA, USA) before and after LSL. Standardized color mono-photographs of blebs were also obtained at each visit. Blebs were assessed for the following qualitative features: bleb height, thickness of the conjunctiva in the bleb wall, apposition of the scleral flap to underlying sclera and patency of the internal ostium. High blebs were defined as total bleb height (TH) exceeding twice scleral thickness S (i.e., TH>2S), moderate height blebs as S<TH<2S and low blebs as TH<S.
Results: Seven blebs in eyes of 7 patients were imaged. There were 4 men (57.1%) and the mean age of patients was 66.0 ± 12.0 years. Pre LSL, 5 blebs were low and 2 were of moderate height. After LSL, 6 out of 7 eyes (85.7%) showed an increase in total bleb height. In these 6 eyes, the bleb wall thickness increased and the scleral flap was found to have separated from sclera with the formation of a hyporeflective area between scleral flap and sclera, suggestive of an aqueous filled space. In one eye, there was no discernable change in bleb height, cavity height or wall thickness.
Conclusions: AS-OCT was able to demonstrate features of bleb morphology that changed after LSL. The results of this study support the potential use of AS-OCT in imaging blebs after trabeculectomy.
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P200 COMPARISON THE MEASUREMENTS OF AS-OCT SCANNING IMAGES USING ANTERIOR SEGMENT ANALYSIS PROGRAM AND MATLAB CUSTOM ANALYSIS SOFTWARE

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Purpose: To compare the measurements of anterior segment optical coherence tomography (AS-OCT) scanning images using two different forms of software: Anterior Segment Analysis Program (ASAP) based on ImageJ and a custom software based on Matlab.
Participants, Methods, Outcome measures: Ten normal subjects were recruited from the glaucoma service at the National University Hospital, Singapore. All subjects underwent imaging of the nasal and temporal anterior chamber angles with a prototype AS-OCT by a single operator. Only images of right eyes acquired under light conditions were chosen for this study. All images were measured offline by an independent, masked observer using two different forms of analysis software. The following parameters were measured: anterior chamber depth (ACD), lens vault (LV), scleral spur-to-scleral spur distance (SSD), angle opening distance at 500um and 750um from the scleral spur (AOD500 and AOD750) and angle recess area at 500um (ARA500). Both forms of software used the same definition for ACD, LV and SSD. While the Matlab analysis software used conventional definitions of AOD (defined as the distance along a perpendicular line from the corneal endothelium to the anterior iris surface at a given distance from the scleral spur) and ARA (the area bound by the corneal endothelium, anterior iris surface and the AOD), the ASAP used modified definitions of AOD (distance of chord drawn from the corneal endothelium to the anterior iris surface, in a circle of a given radius from the scleral spur) and ARA (area within the circle of a given radius, bounded by the cornea endothelium and anterior iris surface) which we believe are more reliable. The intraclass correlation coefficient (ICC) was calculated as a measure of correlation between two forms of software.
Results: Anterior chamber depth (ACD), lens vault (LV), and scleral spur-to-scleral spur distance (SSD) measurements showed excellent correlation (ICC 0.802 - 0.993) between the two forms of software. The temporal and nasal angle parameters (ARA500, AOD500 and ARA750) demonstrated good to excellent (ICC range: 0.548 to 0.758) correlation.
Conclusion: AS-OCT allows quantitative assessment of the anterior segment. Previous studies have demonstrated a high reproducibility of such measurements. As the Matlab software is too cumbersome and time-consuming to use clinically, the ASAP was developed in order to allow a more user-friendly interface. This study shows good to excellent correlation between the two forms of software. The ASAP is a useful tool to be used in combination with the AS-OCT in the analysis of images of the anterior segment.

6.9.2.2. Clinical examination methods: Computerized image analysis: Optical coherence tomography: Posterior

P201 STUDY OF THE CHARACTERISTICS OF RETINAL NERVE FIBER LAYER PARAMETERS DETECTED BY OCT IN 5-40 MYOPIC SUBJECTS

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Objective: To evaluate characteristics of the peripapillary retinal nerve fibre layer (RNLF) thickness parameters and investigate the relationship between RNLF thickness and the diopter in Chinese myopic subjects whose ages ranged from 5 to 40 years with optical coherence tomography.
Methods: The peripapillary RNLFt of 205 myopic eyes and 68 normal eyes were imaged on the Stratus OCTTM 3000. Thickness of the RNLF around the disc was determined with 3.4 mm diameter circle OCT-scan, and it was measured and analyzed using the RNLF thickness average analysis program.
Results: The RNLF is thickest in 7 and 11, and thinnest in 3 according clock type (left eyes reversed to right eyes). The RNLF thickness is thicker in the inferior quadrant (i) and the superior quadrant (s), followed by the temporal quadrant (t), and progressively less in nasal quadrant (n). The RNLFt parameters at 7 clock, 11 clock, smax, imax, smax/imax, and max-min did not have statistically significant differences ($p>0.05$) between normal control and myopic groups. There were statistically significant differences ($p<0.05$) at 3 clock, 4 clock, and nasal RNLFt parameters. By partial correlation analysis existed the relationship between the myopic diopter and the RNLFt parameters in the myopic eyes after the age factor was controlled. The RNLFt parameters in the superior and nasal had negative correlation with myopia diopter($r=-0.183\sim-0.362$, $p=0.009\sim0.000$, $p<0.05$), but that in the inferior quadrant and the temporal quadrant did not have statistically significant correlation with diopter ($r=0.005\sim0.122$, $p=0.942\sim0.082$, $p>0.05$).
Conclusion: The nasal RNLF thickness decreased was detected out in mild myopic subjects, and it was more obviously in the moderate and severe myopia patients. However, there were no significant changes in the temporal part and the temple-inferior part. The characteristics of the myopic RNLF thickness should be considered carefully, when we identified RNLF thickness changes between subjects in myopia and patients who suspected for early glaucoma.

P202 THE STABILITY STUDY FOR THE RNFLT PARAMETERS DETECTED BY OPTICAL COHERENCE TOMOGRAPHY IN NORMAL CHINESE

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Objective: To evaluate the stability of the parameters of retinal nerve fiber layer thickness (RNLFt) detected by OCT and investigate the relationship between RNLFt and gender, right or left eye, and ages.
Methods: The 121 normal subjects (242 eyes) with age from 5 to 40 years old. The RNLF parameters around the disc 3.4 mm diameter was taken on Stratus OCTTM 3000 at all enrolled participants and it was analyzed with the RNLFt average analysis program.
Results: The coefficient of variation (%) of the RNLFt parameters in terms of clock (1,2,~,12) were 19.06, 23.56, 20.33, 20.52, 17.80, 16.39, 13.72, 19.93, 16.01, 16.42, 12.63, and 18.0 , respectively. The in the superior, nasal, inferior, temporal quadrant and average thickness were 11.84, 17.71, 11.26, 15.15, and 8.43, respectively. Some RNLFt parameters including 2,3,7,10,n,t, and smax/tavg had statistically significant differences (t=2.257~3.344, p=0.025~0.001, p<0.05) between genders. Some RNLFt parameters including 4, 5, 6, 7, 9, i, smax, imax, smax/imax, and max-min did not have statistically significant differences (t=1.706~0.030, p=0.091~0.976, p>0.05) between right eyes and left eyes. The parameters including 1,4,9, n, imax, and imax/tavg had statistically significant differences (p<0.05) among different age groups.
Conclusions: The most stable is average thickness among the 24 oct parameters. The more stability is in s and i than n quadrant. The variation of 7 and 9 o'clock is the least. Some RNLFt parameters have statistically significant differences between gender, eyes and among age groups. We should choose more stability parameters for early glaucoma diagnosis.

P203 COMPARISON OF INDIGENOUSLY DEVELOPED OCT BASED AUTOMATED CLASSIFIERS WITH THOSE OF HRTII FOR DETECTING GLAUCOMATOUS DAMAGE

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Purpose: To compare the performance of onh and peripapillary RNLF parameter based formulae generated by OCT with those by CSLO using HRT II (Heidelberg Retinal Tomograph; for the detection of early to moderate glaucoma from healthy eyes.
Design: Cross sectional study.
Methods: One hundred and twenty eyes of 120 consecutive and eligible subjects (60 glaucomatous patients and 60 healthy controls) underwent CSLO and OCT tests. Glaucoma was staged on visual field criterion. The linear discriminant functions (LDF) and the Moorfields regression analysis (MRA) software inbuilt in the HRT II were evaluated and compared statistically with indigenously developed OCT based algorithms namely artificial neural network (ANN), linear discriminant functio n(LDF) and classification and regression tree (CART).
Results: The average RNLF thickness had the highest area under ROC curve (AUC) for differentiating moderate glaucoma (0.953), as well as early glaucoma patients (0.937) from controls amongst the OCT parameters. In ONH evaluation, the largest AUC was for the vertical cup/disc ratio both in differentiating normal subjects from moderate (0.951) as well as the early glaucoma group (0.911). Amongst all the HRT II parameters, the vertical cup/disc ratio had the highest AUC in differentiating early (0.852) as well as moderate glaucoma eyes (0.894) from the control subjects (fig. 1).
Conclusion: OCT-based classifiers have a higher sensitivity and specificity in detecting early glaucoma from those inbuilt in HRT. Amongst the three indigenously developed OCT classifiers, LDF had the highest AUC and the lowest misclassification rate
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P204 A COMPARISON OF RETINAL NERVE FIBER LAYER THICKNESS DISTRIBUTION AND DIAGNOSTIC CAPABILITY OF FOURIER-BASED ANALYSIS OF MYOPIC AND NON-MYOPIC EYE

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Purpose: To compare the distribution of retinal nerve fiber layer thickness and diagnostic capability of Fourier-based analysis of RNFL thickness distribution between myopic and non-myopic eyes.
Design: Cohort study.
Participants: Forty healthy individuals and 40 glaucoma patients with myopia of -5 diopters and greater and 40 healthy individuals and 40 glaucoma patients with less than -5 diopters.
Testing: All subjects were imaged using optical coherence tomography (OCT 3000, Zeiss-Humphrey).The pattern of thickness measurements from SLP and OCT in the 32 sectors around the optic disc was analyzed to obtain the Fourier coefficients. The fast Fourier transformation was employed to determine the coefficients. The values were entered into linear discriminant analysis.
Main outcome measures: Receiver operating characteristic (ROC) curve were used to compare the performance of the Fourier-based metrics against other commonly used RNFL analytical procedures.
Results: In healthy individuals with and without severe myopia, OCT showed the double-hump pattern, and also showed that both peaks were shifted to more temporal ac-

cording to the severity of myopia. The area under the ROC curve (AUC) using the linear discriminant function based on Fourier analysis was 0.884 and 0.949 in eyes with and without severe myopia, respectively, and greater compared with any conventional analytical procedures. To improve diagnostic capability, eyes with severe myopia were divided based on the severity of myopia; -5 to -7.9 diopters, -8 to -9.9 diopters and -10 diopters and higher. The AUC was 0.949 in eyes with -5 to -7.9 diopters, 0.915 in eyes with -8 to -9.9 diopters, and 0.898 in eyes with -10 diopters and higher.
Conclusions: In patients with severe myopia, the discriminant function based on the output from a Fourier analysis of RNFL data resulted in better diagnostic capability compared with other common RNFL analytical procedures. Diagnostic capability improved when subjects were divided based on myopic refraction.

P205 COMPARISON OF 3.4 MM VS. 2.27X PROPORTIONAL SCANNING PROTOCOLS OF OPTICAL COHERENCE TOMOGRAPHY FOR MEASURING RETINAL NERVE FIBER LAYER THICKNESS IN DIFFERENT-SIZED OPTIC NERVE HEADS

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Purpose: To compare retinal nerve fiber layer (RNLF) measurements by optical coherence tomography (OCT) using different scan protocols in normal, disc suspect and glaucomatous eyes with different-sized optic nerve heads.
Design: Prospective, cross-sectional observational study.
Participants: Thirty-two normal, 53 disc suspect and 30 glaucomatous eyes of the same number of adult subjects aged between 40-70 years.
Methods: Using the Stratus OCT', disc size was measured using the fast optic disc scanning protocol. Based upon published data of optic disc size measured by OCT, eyes with disc area 1.85'2.75 mm^2 were classified as average- sized discs, while those with less than and greater than this range were grouped into small and large-sized discs respectively. RNLF thickness was measured using the 'standard' fast RNLF 3.4 mm and 2.27x proportional scan protocol.
Main outcome measures: Average and inferior average RNLF thickness measurements by each scan protocol was compared in different-sized optic discs in each diagnostic group.
Results: The mean disc area was 2.74 ± 0.34 mm^2, 2.77±0.53 mm^2, and 2.65 ± 0.69 mm^2 in normal, disc suspect and glaucomatous eyes respectively. Only 2 eyes each in normal and glaucoma groups had small discs and were excluded from analysis. In normal subjects, there was no significant difference in RNLF thickness (p=0.823 and 0.478 respectively) in average sized or large discs using the standard protocol (table 1). Using the proportional scan, RNLF measurements in large discs were significantly thinner compared to average-sized discs (p=0.008; p=0.004). In disc suspects with large discs, RNLF measurements using standard protocol were similar to that in normal subjects, but were significantly thicker compared to disc suspects with average-sized discs(table 2). Using standard protocol, glaucomatous eyes with large discs showed significantly thicker (p=0.140) RNLF measurements compared to those with average-sized discs (table 3). Measurements using the proportional scan protocol were similar in average and large-sized discs (p=0.836; p=0.594), despite less severe disease in the latter.
Conclusions: In normal subjects, the disc size does not appear to affect RNLF measurements by OCT using the standard fast scanning protocol. This may indicate that the distance from the centre of the optic disc is what determines the RNLF thickness, rather than distance from the optic disc margin as believed. Standard 3.4 mm scanning protocol should be employed while measuring RNLF thickness by the OCT. The 2.27x- proportional scanning protocol may lead to fallacious measurements in large-sized discs, and should be avoided.
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P206 EVALUATION OF THE STAGE OF GLAUCOMATOUS DAMAGE MEASURED BY VISUAL FIELD AND OPTIC COHERENCE TOMOGRAPHY

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Purpose: To evaluate the relationship between visual field and retinal nerve fiber layer (RNLF) thickness measured by optical coherence tomography (OCT) to stage the glaucomatous damage.
Methods: A total of 86 eyes of 21 normal and 21 eyes of early glaucoma, 24 eyes of moderate glaucoma and 20 eyes of severe glaucoma patients were enrolled in the study according to visual field scores staged with Hodapp-Parrish Anderson (HAP) criterias. Thickness of the RNLF around the optic disc was determined with three 3.4 mm diameter circle OCT scans and also optic nerve parameters were evaluated. Average and segmental RNLF thickness values were compared among all groups. The correlation between mean deviation and RNLF thickness in the groups was also analyzed. Receiver operating characteristic (ROC) curve area was calculated to discriminate normal eyes from glaucomatous stages.
Results: The average RNLF thickness (0.983), inferior average (0.978), 6 o'clock (0.966), horizontal integrated rim width (0.937) and vertical integrated rim area (0.933) had the strongest correlation in all parameters.
Conclusion: OCT measurements of RNLF thickness may provide clinically important information in staging the glaucomatous damage.

P207 CORRELATION BETWEEN OPTICAL COHERENCE TOMGRAPHY RESULTS AND SCORING TOOL FOR ASSESING RISK (S.T.A.R.) IN PATIENTS WITH OCULAR HYPERTENSION

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Purpose: To correlate the retinal nerve fiber layer thickness (RNLF) and optic nerve head (ONH) parameters measured by optical coherence tomography (OCT) results with scoring tool for assesing risk (S.T.A.R.) Threshold in patients with ocular hypertension (OH).
Material and Methods: Ninety-two patients with OH were divided into low (32 patients) moderate (36 patients) and severe (24 patients) risk groups according to S.T.A.R. Calculating criterias and correlated to oct measurements of RNLF and ONH parameters. For the fast RNLF thickness protocol, three 3.4-mm diameter circular scans were acquired. Major parameters were average RNLF thickness, superior quadrant, nasal quadrant, inferior quadrant, temporal quadrant and segmental thickness per 12 o'clock hours. The fast optic nerve parameters were vertical integrated rim area (vira), horizontal integrated rim width (HIRW), disc diameter, disc area, cup area, rim area, cup/disc (c/d) area ratio, horizontal c/d ratio and vertical c/d ratio. Receiver operating characteristics (ROC) curves and areas under these curves (AROCs) were produced for OCT parameters.
Results: The c/d area (0.883), c/d vertical (0.881), vira (0.871), inferior RNLF (0.820), HIRW (0.814), average RNLF(0.786),and 6 o'clock hour (0.773) had the strongest correlation in all groups for OCT analysis.
Conclusions: The average RNLF, inferior average, 6 o'clock hour segmental analyses for fast RNLF measurement and vira, HIRW, c/d area, c/d vertical for fast optic disc measurement were the best parameters for S.T.A.R. Staging in patients with ocular hypertension.

P208 RETINAL NERVE FIBER LAYER THICKNESS IN NORMAL, OCULAR HYPERTENSIVE AND GLAUCOMATOUS INDIAN EYES: AN OPTICAL COHERENCE TOMOGRAPHY STUDY

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Purpose: Studies using the stratus oct in normal Asian Indian eyes and Chinese eyes have demonstrated significantly thicker RNLF thickness measurements compared to Caucasian eyes. This may affect RNLF measurements in ocular hypertensive and glaucomatous eyes. We conducted this study to ascertain RNLF thickness measurements in normal, ocular hypertensive (OHT) and glaucomatous Asian Indian eyes.
Design: Prospective, observational cross-sectional study.
Participants: This study included patients with OHT, primary open angle glaucoma (POAG) and age-matched normal controls.
Methods: All included subjects were scanned with the Zeiss Optical Coherence Tomographer Stratus-OCT. The peripapillary RNLF thickness was scanned using the fast RNLF protocol. The global and four-quadrant average RNLF thickness was computed.
Main outcome measures: The main outcome measures were differences in RNLF thickness measurements between the three groups. Analysis of variance with post-hoc Bonferroni comparisons was used to assess the differences in RNLF measurements between normal subjects and patients with OHT and POAG. Receiver operating characteristics (ROC) curves and areas under these curves (AROCs) were calculated for average RNLF and four quadrant average measurements.
Results: Twenty-three eyes of 23 POAG patients, 24 eyes of 24 OHT and 48 eyes of 48 normal controls were analyzed. RNLF thickness measurements with AROC values of the three groups are detailed in table 1. ROC curves are depicted in figure 1. The superior, inferior and global RNLF measurements were significantly thinner in ocular hypertensives compared to normals (p=0.031,0.019 and 0.022 respectively). All five RNLF parameters were significantly thinner in the POAG group compared to OHT group (p<0.001). Parameters with largest AROCs for distinguishing glaucoma from OHT were average and inferior average RNLF measurements (0.989 and 0.979 respectively). Inferior and superior RNLF measurements had largest AROCs (0.717 and 0.700 respectively) to distinguish OHT from normal eyes.
Conclusions: Stratus-OCT detected significant quantitative differences in RNLF thickness between normal, ocular hypertensive and glaucomatous eyes. Our study, along with other studies on Asian eyes, has demonstrated that normal RNLF measurements in Asians are different from that reported from normal caucasian eyes (table 2). Any attempt to predict the probability of glaucoma must logically be based upon a normative database representative of the population being investigated.
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P209 OPTICAL COHERENCE TOMOGRAPHY (OCT) AND HEODERBERG RETINA TOMOGRAPHY II (HRT-II) IMAGING OF SUPERIOR SEGMENTAL OPTIC NERVE HYPOPLASIA (SSOH) PATIENTS

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Purpose: To report the usefulness of optical coherence tomography (OCT) and Heidelberg Retina Tomography II (HRT-II) imaging on the diagnosis for superior segmental optic nerve hypoplasia (SSOH) in nine Japanese patients.
Design: Observational case series.
Participants: Sixteen eyes of 9 patients with SSOH, 6 male and 3 female diagnosed in ophthalmology, University of the Ryukyus.
Methods: OCT and HRT-II imagings were taken for all patients.
Main outcome measures: Visialization of loss of superior RNLF.
Results: All patients showed good corrected visual acuity (20/20) and normal intraocular pressure. No patient had

maternal diabetes mellitus. Diagnosis of SSOH had made by the ophtalmoscopic findings and visual field test. HRT-II either OCT-3000 clearly showed loss of superior rim of optic disc and retinal nerve fiber layer (RNLF).
Conclusion: In accordance with the ophthalmoscopic findings of superior entrance of central retinal artery, loss of superior RNLF, superior disc pallor, or superior scleral halo, HRT-II and OCT-3000 imaging showed the loss of superior RNLF. These imaging technologies are useful to have quantitative data in SSOH patients.
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P210 THE EFFECT OF AGING ON GLAUCOMATOUS RETINAL NERVE FIBER LAYER THICKNESS CHANGES AS MEASURED BY STRATUS OCT
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Purpose: To determine the effect of age on the retinal nerve fiber layer (RNLF) in glaucomatous and non-glaucomatous eyes as measured by Stratus OCT (optical coherence tomography).
Design: Cross-sectional observational study.
Participants: Four hundred thirty-five glaucoma patients and forty-five normal subjects 22 to 86 years old.
Methods: Glaucoma defined on the optic disc appearance typical for the disease, different subgroups selected by the hodapp-classification system based on humphrey standard automated perimetry findings (sita standard 24-2) and peripapillary fast RNLF scans performed by Stratus OCT with a diameter of 3.4 mm centered on the optic disc performed on one randomly selected eye of each subject.
Main outcome measures: Linear regression analysis of the effect of age on peripapillary RNLF thickness in the different groups.
Results: The mean average (AVG) RNLF thickness for early-glaucoma group (mean MD1.92 DB, 95% confidence interval, CI,2.03-1.81) was 86.87±12.97 µm, in the moderate-glaucoma group (mean MD8.37 DB, 95% CI8.85-7.89) was 61.45±13.78 µm and in advanced-glaucoma (mean MD20.51DB 95% CI21.92-19.11) 46.97±10.39 µm. In all our regression analyses age was treated as independent variable, while RNLF avg dependent variable. In normal subjects peripapillary RNLF loss can be estimated as0.36 µm per year, coefficient of determination (r2)=0.1368, in early-glaucoma 0.39 µm RNLF loss can be detected (r2)=0.1277. In moderate and advanced disease 0.26 µm and 0.18 µm RNLF decline is found, with (r2)=0.0375 and (r2)=0.0379, respectively.
Conclusions: The effect of age on RNLF loss can be detected in all stages of glaucoma. In earlier stages there is a more pronounced decline with age, while in more advanced stages the difference and the effect is more subtle. A cross-sectional study cannot define the temporal effect of structural changes on functional results, but may give important information in assessing the pattern of glaucomatous progression.
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P211 STRUCTURE FUNCTION RELATIONSHIPS CORRELATION BETWEEN RETINAL NERVE FIBER LAYER THICKNESS AND VISUAL FIELD CHANGES.
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Purpose: To evaluate the strength and pattern of the relationship between visual field (VF) sensitivity (MS) or deficiency (MD) and retinal nerve fiber layer (RNLF) thickness measurements by optical coherence tomography (OCT).
Design: Cross-sectional comparative study.
Participants: Sixty primary open-angle glaucoma patients and 40 healthy controls were included.
Methods: Measurements using stratus OCT and standard automated perimetry (program G2, Octopus, Interzeag), were obtained.
Results: Relationships were curvilinear with the DB scale, with logarithmic regression of DB VF sensitivity against RNLF thickness being significantly better than linear regression. Logarithmic regression of 1/l VF sensitivity against RNLF thickness was no better than linear regression for all sectors. Structure function relationships generally were strongest between the inferotemporal RNLF sector and the superonasal visual field.
Main outcome measures: MS and MD was recorded in the db and the 1/l scales. Linear and logarithmic relationships were sought globally and in four VF sectors and correlated with RNLF thickness.
Conclusions: The strength of the structure/function relationships compare well with previous reports in the literature. The relationships were curvilinear with the db scale and linear with the 1/l scale. The measurements suggest that RNLF thickness may be a more sensitive measurement for early stages to moderate and perimetry a better measure for advanced (ms <18db / md >12db) stages of glaucoma.
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6.9.5. Clinical examination methods: Computerized image analysis: Other

P213 THE CORRELATIONS BETWEEN RETINAL NERVE FIBER LAYER DEFECT AND PERIPAPILLARY ATROPHY

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Purpose: The azimuthal and quantitative correlation between retinal nerve fiber layer (RNFL) defect and peripapillary atrophy (PPA) in patients with retinal nerve fiber layer defect was evaluated.
Design: Retrospective chart review study.
Participants: Eighty patients who had single localized RNFL defect.
Methods: In the digital RNFL photos of the patients, the parameters of RNFL defect and PPA were measured manually by one examiner. The border of the cup and disk of optic nerve head, and PPA was determined semi-automatically, and the parameters of cup and disc were calculated automatically on the basis of the center of mass and eigen-value/vector. The correlation between these parameters was analyzed.
Main outcome measures: Width and the azimuth of RNFL defect. Those of PPA and the location of the point of maximum radial extent of PPA, the location of the point of maximum radial extent of PPA, area and major/minor axis length of cup, disk, and PPA.
Results: Forty-seven patients out of 80 showed both RNFL defect and PPA. They were younger (p=0.036), and had wider and more inferiorly located RNFL defect, compared to the rest 33 patients with RNFL defect only. There was linear correlation between the azimuth of RNFL defect and the axis of PPA, and the RNFL defect was about 30 degrees inferiorly located to PPA. The width of RNFL defect was correlated to the PPA area to disc area ratio and to the cup to disc ratio with marginal significance, but not to the PPA.
Conclusions: PPA was a risk factor for younger patients and larger RNFL defect. There were significant azimuthal correlation between RNFL defect and the axis of PPA and marginally significant correlation between RNFL defect and the PPA area to disc area ratio.

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P214 THE CLINICAL EFFICACY OF COMPUTER SOFTWARE IN RECOGNIZING LOCALIZED RETINAL NERVE FIBER LAYER DEFECT

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Purpose: A software which quantitatively detects retinal nerve fiber layer defects in the red-free RNFL photograph was developed. The clinical efficacy of the software recognizing RNFL defect in the RNFL photographs were evaluated.
Design: Computerized digital image analysis
Participants: Fifty-three normal RNFL photographs without RNFL defect and 38 RNFL photographs with a single localized (defined to be less than 45 degrees in width) RNFL defect that were confirmed by two glaucoma experts.
Methods: RNFL photos with or without RNFL defect were analyzed by the newly developed software for the existency and extent of RNFL defect. The results were compared with that determined by two experts.
Main outcome measures: The existency, location and width of RNFL defect.
Results: The normal group consisted of 22 men and 31 women with average age of 48.2±15.2 years. The defect group consisted of 19 men and 17 women with average age of 53.1±11.4 years. In 53 normal RNFL photos, 43 photos were recognized to be normal, but 10 were perceived to have RNFL defect (specificity = 81%). Of 36 photos of localized RNFL defect, all were recognized to have RNFL defect (sensitivity = 100%). The recognized location of start-point and end-point were very similar to the experts results (p=0.180, 0.182). The width were recognized to be a little larger than that were recognized by experts (26.2 degrees vs 21.2 degrees), but was not statistically significant (p=0.055).
Conclusions: The newly developed software showed high level of specificity and sensitivity in recognizing RNFL defect. This software may provide a possibility toward the

objective and quantitative analysis of red-free RNFL photographs in future.

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6.11. Clinical examination methods: Bloodflow measurements

P215 OPTIC NERVE HEAD TOPOGRAPHY, FLOWMETRY AND RETINAL NERVE FIBER LAYER ASSESSMENT IN GLAUCOMA: IS THERE COMPLEMENTARY INFORMATION USING DIFFERENT GLAUCOMA IMAGING MODALITIES?

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Objective: To determine if complementary information can be gained using a combination of different modalities of glaucoma imaging techniques.

Design: Consecutive cross-sectional observational clinical study.

Participants and controls: Three age-matched groups were included in the study (40 patients with early to moderate primary open angle glaucoma, 30 ocular hypertensives, and 25 normals).

Methods: The above mentioned groups were subjected to standard achromatic perimetry using Humphrey field analyzer ii (HFA II), optic nerve head (ONH) assessment using the Heidelberg retinal tomography-1 (HRT-I), retinal nerve fiber layer (RNLF) assessment using the optical coherence tomograph (OCT-1), and optic nerve head blood flow assessment using the Heidelberg retinal flowmeter (HRF). The statistical package for social sciences version 10.1.4 (SPSS 10.1.4) was used to perform statistical analysis.

Main outcome measure: To find the best performing parameters from each diagnostic technique and identify the best combination that could differentiate between normals, POAG patients and patients with ocular hypertension using logistic regression analysis and area under the operating characteristics curve (AUC).

Results: It revealed that the for retinal nerve fiber layer assessment, the best parameter that can discriminate between normal and glaucomatous eyes is the OCT average retinal nerve fiber layer thickness (AUC was 0.855). For HRT the best parameter was the cup disc ratio and rim disc ratio (auc was 0.832) followed by the cup volume (AUC was 0.805). For the HRF, the HRF flow auc was 0.765.the combination that gave best discrimination between normal eyes and eyes with POAG or ocular hypertension was a combination of OCT average RNLF thickness, HRT maximum cup depth, and HRF blood flow. The AUC was 0.960 for the discrimination between normals and POAG, and 0.771 for the difference between normals and ocular hypertensives.

Conclusion: Different diagnostic techniques in glaucoma may have complementary information about the different aspects of glaucomatous damage. The combination of onh assessment using HRT, RNLF using OCT and ONH blood flow using HRF have a better diagnostic accuracy than any of them alone.

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P216 RETINAL ARTERIOLAR AND CAPILLARY RESPONSE TO ISOXIC HYPERCAPNIA IN PRIMARY OPEN ANGLE GLAUCOMA PRE- & POST-TREATMENT

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Purpose: To investigate the magnitude of retinal arteriolar and capillary vascular reactivity in response to isoxic hypercapnia in patients with untreated, newly diagnosed POAG (uPOAG) and progressive POAG (pPOAG), and to determine the magnitude of vascular reactivity after treatment with dorzolamide in uPOAG.

Methods: Seven patients with uPOAG (mean age 52 yrs, range 27-65 yrs), 11 patients with pPOAG defined by the recent occurence of optic disc hemorrhage (mean age 65 yrs, range 52-76 yrs) and 13 controls (mean age 55 yrs range 44-66 yrs) were studied. Isoxic hypercapnia (i.e., A 15% increase in petco2) was induced using a computer driven gas flow controller. Retinal hemodynamic measurements were acquired at baseline and during isoxic hypercapnia using the canon laser blood flowmeter (CLBF) and Heidelberg Retina Flowmeter (HRF). Patients with uPOAG were then treated with dorzolamide 2% for 2 weeks and retinal vascular reactivity assessment was repeated at the end of this regime.

Results: Group mean retinal arteriolar diameter increased by 1.8 3% in both groups of patients with POAG and controls. Group mean arteriolar blood velocity increased by 3%, 10% and 17% during isoxic hypercapnia in uPOAG, pPOAG and controls, respectively, while group mean blood

flow increased by 8%, 14.7% and 22%. Group mean capillary blood flow at the temporal rim of the optic nerve head (ONH) increased by 12%, 10% and 19% during isoxic hypercapnia in uPOAG, pPOAG and controls, respectively. Following treatment with dorzolamide in uPOAG, there was a 5%, 17% and 25% increase in the group mean retinal arteriolar diameter, blood velocity and blood flow respectively, in response to isoxic hypercapnia. Group mean capillary blood flow at the temporal rim of the onh also increased by 25%.
Conclusions: Patients with uPOAG showed a reduced magnitude of change in arteriolar blood flow to isoxic hypercapnia compared to the other groups, while patients with pPOAG showed a reduced magnitude of change in capillary blood flow at the ONH. These early results suggest that treatment with dorzolamide improves retinal arteriolar and capillary vascular reactivity in patients with uPOAG.

6.12. Clinical examination methods: Ultrasonography and ultrasound biomicroscopy

P217 UBM EVALUATION OF THE ANTERIOR CHAMBER IN 1 MM OVERSIZED CORNEAL GRAFTS

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Objective: To evaluate anterior chamber depth and angle in 1-mm oversized corneal grafts.
Design: Cross-sectional observational comparative case series.
Participants: Twelve eyes of twelve patients who had undergone penetrating keratoplasty corneal grafts (1 mm oversized corneal grafts - 6, 0.5 mm oversized corenal grafts - 6) were included in this study.
Intervention: Ultrasound biomicroscopy (UBM) was performed in all the patients 3 months post operatively to evaluate the anterior chamber.
Main outcome measures: The various UBM parameters evaluated were superior and inferior trabecular iris angle (TIA), angle opening distances at 250 and 500 microns (AOD 250 and AOD 500) and central anterior chamber depth (ACD).
Results: Superior TIA was 43.08 ± 12.35 in cases and 24.11± 14.4 in controls and inferior TIA was 4153 ± 8.17 and 18.25 ± 6.5 respectively (p value < 0.05). Superior AOD 250 was 0.294 ± 0.111 and 0.216 ± 0.141 and AOD 500 was 0.477 ± 0.110 and 0.275 ± 0.156 in cases and controls respectively (p< 0.05). Inferior AOD 250 and 500 was 0.279 ± 0.094, 0.157 ± 0.0538 and 0.401± 0.138, 0.271 ± 0.097 in cases and controls respectively (p value < 0.05, 0.08 respectively). Central ACD was 3.38 ± 0.55 mm in cases and 2.71 ± 0.33 mm in controls (p value < 0.05).
Conclusions: One mm oversized corneal grafts provide adequate central and peripheral anterior chamber depth and reduce the risk of peripheral anterior synechiae and secondary glaucoma.
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P218 APPOSITIONAL CLOSURE IDENTIFIED BY ULTRASOUND BIOMICROSCOPY IN GONIOSCOPICALLY NARROW ANGLE PEOPLE --- THE LIWAN EYE STUDY

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Purpose: Visibility of posterior (usually pigmented) trabecular meshwork (TM) in static gonioscopy is commonly used as a sign of a pathologically narrow angle. This study attempts to assess the proportions of appositional closure identified by ultrasound biomicroscopy (UBM) in gonioscopically narrow angle suspects.
Design: Cross-sectional study.
Participants: One hundred seventeen narrow-angle suspects and 57 normal controls with available UBM data identified from a population-based study.
Methods: Narrow-angle suspects were defined as having posterior (usually pigmented) TM being not visible in 2 or more quadrants using static gonioscopy. Narrow angle suspects and 1 out of 10 out those who did not meet this criterion were identified from a population-based survey. Irido-trabecular meshwork contact (ITC) was identified and classified into low and high by referring to standard UBM photos. Those with high ITC were further classified into b-type and s-type.
Main outcome measures: Proportion of irido-trabecular meshwork contact, Shaffer angle width.
Results: ITC was identified in 78.6% of the superior, 40.2% of the nasal, 59.8% of the inferior and 25.6% of the temporal quadrants in the narrow angle suspects. These proportions were 43.9%, 15.8%, 29.8% and 14.0% in the normal controls respectively. About two-thirds of the ITCs were classified as high. In those with high ITC, the ratio between b-type and s-type ITCs were approximately 1:1. The proportions of high ITCs increased substantially from 15.4% in those with Shaffer angle grade 4 and 45.0% in grade 3, to 71.0% in grade 2, 70.2% in grade 1 and 86.4% in grade 0.
Conclusions: It is important to realize that 'not seeing the TM' does not itself imply physical contact between iris and TM, it only suggests the iris is convex to an extent that obscuring the visibility of TM when performing a static gonioscopy. The high rate of appositional contact in 'normal' people illustrates a poor specificity using the current gonioscopic definition.
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P219 ULTRASOUND BIOMICROSCOPY OF AQUEOUS OUTFLOW AFTER TRABECULECTOMY WITH MITOMYCIN C

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Purpose: To study the aqueous outflow by using ultrasound biomicroscopy (UBM) in an early stage after trabeculectomy with mitomycin c (MMC).
Design: Prospective cohort study.
Participants: Twenty patients (20 eyes) with medically uncontrolled glaucoma from various causes were enrolled in the study.
Intervention: A fornix-based conjunctival flap trabeculectomy with MMC was performed in all patients with the same technique. The concentration of MMC (0.2 mg/ml or 0.4 mg/ml) and duration of application (range 1-2 minutes) were used depending on tendency of filtration failure. The UBM was conducted within 2 weeks after the procedure.
Main outcome measures: Post-operative Goldmann applanation tonometry, completed slit-lamp biomicroscopy and indirect ophthalmoscopy were done in day 1, week 1 and week 2. The UBM was conducted to establish the outflow of aqueous humor.
Results: Low-to-medium reflectivities inside the bleb with fluid-filled spaces in the subconjunctival area were demonstrated in all cases. Supraciliochoroidal fluid (SCF) as detected in 10 eyes (50%), 2 eyes also had minimal choroidal detachment as seen with an indirect ophthalmoscope. The intraocular pressure (IOP) (mean + sd) was 4.5±2.99 mmHg in eyes with SCF, which was significantly lower than the IOP (9.7±3.34 mmHg) in eyes without SCF (p=0.001 by Mann-Whitney test). We classified the SCF into 3 groups; mild, moderate and marked effusion, and we found them in 10%, 20%, 70%, respectively. No significant correlation between the concentration of MMC and the detection of SCF.
Conclusions: The UBM findings can demonstrated the aqueous outflow after trabeculectomy through 2 pathways; conventional subconjunctival space and through the suprachoroidal space. The eyes without demonstrated SCF by UBM probably have subclinical or microscopic SCF.

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P220 THE FINDINGS OF ULTRASOUND BIOMICROSCOPY AND OPTICAL COHERENCE TOMOGRAPHY IN COMBINED PUPILLARY BLOCK AND CILIARY BLOCK GLAUCOMA FOLLOWING NEEDLING BLEB REVISION

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Purpose: Ciliary block glaucoma (malignant glaucoma) is a multifactorial glaucoma most commonly occurs after incisional surgery. The three most important conditions required to be differentiated from malignant glaucoma are pupillary block, choroidal detachment, and suprachoroidal hemorrhage. We report a case of combined papillary block and ciliary block glaucoma following needling bleb revision in uveitic patient.
Design: Case report.
Patients and Methods: A 37 year old Thai man with uveitic glaucoma developed painful red eye, flat anterior chamber, and elevated IOP after needling bleb revision. The patient was referred to our institute for further management. The diagnosis of combined papillary block and ciliary block glaucoma was made from ultrasound biomicroscopy (UBM) and optical coherence tomography (OCT). The patient underwent laser peripheral iridotomy and subsequent successful phacoemulisification and posterior chamber intraocular lens implantation. UBM and OCT were used to image the anterior segment structures before and after each procedure.
Main outcome measures: The findings of UBM and OCT.
Results: Both instruments showed extremely shallow anterior chamber, marked displacement of the anterior segment structures, and iris bombe. UBM revealed more details of pupillary block characteristics as well as ciliary block characteristics. Choroidal effusion was excluded by b-scan ultrasonography. After laser iridotomy deepening of the anterior chamber occurred. UBM showed persistent ciliary body anterior rotation despite patent iridotomy which normalized after resolution of the malignant glaucoma.
Conclusion: Pupillary block must be ruled out before the diagnosis of malignant glaucoma can be made. In rare conditions postoperative flat anterior chamber and elevated intraocular pressure can be caused by combined pupillary block and ciliary block mechanisms. The UBM provides more information in the pathophysiology of the disease when compares to the OCT.

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P221 APPOSITIONAL ANGLE-CLOSURE DETERMINED BY ULTRASOUND BIOMICROSCOPE (UBM) CORRELATES WITH PRONE-DARK PROVOCATIVE TEST FOR PRIMARY ANGLE CLOSURE EYES

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Purpose: To evaluate the effectiveness of UBM imaging on the prognosis of primary angle-closure (PAC) and suspect.
Design: Observational case series.
Participants: 73 eyes of 37 appositional angle closure patients diagnosed by UBM.
Methods: Number of quadrants of appositional angle-closure was determined by UBM in the dark. The subjects were performed gonioscopy to rule out synechial angle-closure. Subjects were underwent prone-dark provocative tests (1 hr).
Main outcome measures: Correlation between the angle closure and the results of dark room prone test.
Results: Intraocular pressure (IOP) of pre-prone-dark test was not correlated with the distribution of appositional angle-closure (r=0.061, p=0.61). The other hand, post-prone-dark test IOP or the change in IOP was positively correlated with the width of appositional angle-closure (r=0.48 and 0.54 respectively, Pearson's test, p<0.0001).
Conclusions: Appositional angle-closure diagnosed by UBM in the dark may induce transient IOP elevation. In the dark UBM may be useful modality to determine the risk for development of primary angle-closure glaucoma in PAC eyes.
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P222 ULTRASOUND BIOMICROSCOPIC (UBM) FINDINGS OF PRIMARY ANGLE-CLOSURE IN HIGHLY MYOPIC EYES.

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Purpose: To report the ultrasound biomicroscopic (UBM) findings of primary angle-closure (PAC) with highly, myopic eyes.
Design: Case report.
Participants: Seven eyes of 4 patients with PAC in high myopia (<9.0 d) diagnosed in ophthalmology, University of the Ryukyus in 7 years (from 2000 to 2006).
Interventions: Slit-lamp examination, indentation gonioscopy and UBM examination. The refractive error, axial length measured by a-mode ultrasound, and past history of acute attack of PAC were retrospectively collected from medical records.
Main outcome measures: UBM findings of the PAC eyes with high myopia.
Results: Refractive error ranged from18.25 to10.50 d. UBM showed primary pupillary block in two patients, pupillary block with small uveal effusion in a patient, and plateau iris configuration in another patient.
Conclusion: In PAC eyes with high myopia have a variety of the mechanisms for angle-closure. UBM examination is extremely useful to diagnose the mechanism of PAC in highly myopic eyes.
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P223 ULTRASOUND BIOMICROSCOPY EVALUATION OF ANTERIOR SEGMENT MORPHOLOGY IN EYES WITH NARROW ANGLE WHERE LASER IRIDOTOMY WAS DONE IN TWO DIFFERENT SITES

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Purpose: To do a comparative analysis of anterior segment morphology in eyes with narrow angle following laser iridotomy at 12 and 1 o'clock position using ultrasound biomicroscope (UBM).
Design: Prospective analysis of two case series from december 2005 to january 2006.
Participants: Thirty-four eyes of 27 participants (16 males and 11 females) were included in the study. Age of the patients varied from 44 yrs to 55 yrs.
Method: All the 27 participants were subjected to gonioscopic evaluation by Zeiss 4 mirror gonioscopy and the grading of the angles were noted from 0 to 1 in Shaffer's system without any peripheral anterior synaechia. Radial UBM scan was performed at 12 and 6 o' clock position before laser iridotomy using oti UBM model with the help of 35 mhz transducer. The patients were then divided into 2 groups.18 patients were alloted in group a where laser iridotomy was done at 12 o' clock position and 16 patients were put in group b where iridotomy was done at 1 o' clock position. UBM was repeated again after 2 weeks of iridotomy using same model and transducer.
Main outcome measures: UBM parameters of angle measurement used in this study were angle opening distance (AOD) and trabecuar-iris angle (TIA) at superior and inferior level.
Results: Following laser iridotomy an increase of mean superior AOD was found to be 51.73±4.85 micro mm in group a and 46.06±1.38 micro mm in group b. Similarly inferior AOD increment was noted 51.10±2.78 in group a and 47.85±2.78 in group b. Laser iridotomy also resulted an 7.46±2,54 degree increment of mean superior TIA in group a and 6.8±2,14 degree in group b. The mean in-

ferior tia also increased 5.9± 4.1 degrees in group a and 5.2±3.8 degrees in group b. Though all the parameters in this study increased following laser iridotomy, no significant difference in these increments was noted in the two different group mentioned in the study.
Conclusion: Ultrasound biomicroscopic documentation confirms that the site of peripheral iriodotomy does not significantly influence the widening and deepening of anterior chamber angle.
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P224 CHANGES OF CILIARY BODY POSITION AFTER CATARACT SURGERY IN PRIMARY ANGLE-CLOSURE (PAC) EYES
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Purpose: To evaluate the changes of ciliary body position after cataract surgery in primary angle-closure (PAC) eyes by ultarasound biomicroscope (UBM) examination.
Design: Interventional case series.
Participants: Thirteen eyes of 13 patients underwent cataract surgery (phacoemulfisication, aspiration and intraocular lens implantation: PEA-IOL) were studied by UBM exam under blight light illumination and in the dark before and one month after the surgery. Anterior chamber depth (ACD), angle open distance 500 (AOD500), trabecular-ciliary process distance (TCPD), and iris-ciliary process distance (ICPD) were determined.
Main outcome measures: Changes of angle structures.
Results: ACD, AOD500 were significantly increased in all four quadrants after PEA-IOL. TCPD was increased in the nasal quadrant. ICPD was not affected by PEA-IOL.
Conclusions: Angle opening after PEA-IOL was dominantly by the change of acd and iris position determined by the lens thickness, but may not by relative ciliary body position against the iris.
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P225 A PROSPECTIVE ULTRASOUND BIOMICROSCOPY EVALUATION OF CHANGES IN ANTERIOR SEGMENT MORPHOLOGY BEFORE AND AFTER LASER IRIDOTOMY IN EUROPEAN EYES
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Purpose: The aim of this study is to quantify changes in anterior segment morphology by use of ultrasound biomicroscopy (UBM) after Nd:YAG laser iridotomy in primary angle closure glaucoma (PACG) in European patients.
Patients and Methods: Thirty-five eyes of 28 consecutive patients presenting a PACG at our clinic were examined by UBM at presentation, and one week after a Nd:YAG laser peripheral iridotomy (LPI). Mean age of patients was 62.9 ± 15.0 (SD) years. Sixteen patients were females (55%). The trabecular-iris angle (TIA) was measured in the superior, nasal, inferior, and temporal quadrants. Baseline measurements were made under darkness conditions.
Main outcome measures: UBM measurements of the trabecular-iris angle (TIA).
Results: All measurements were made in four quadrants. Before LPI, mean superior TIA was 4.35 ± 5.24° (mean ± SD), nasal TIA was 6.90 ± 6.03°, inferior TISA was 5.82 ± 6.82° and temporal TIA was 6.49 ± 5.56°. After LPI, these values increased respectively to 8.53 ± 6.32° ($p = 0.039$), 12.61 ± 7.39° ($p = 0.044$), 13.47 ± 8.81° ($p = 0.035$), and 15.25 ± 9.03° ($p = 0.005$), showing a significant widening of the angle in all four quadrants. No serious LPI-related complications were encountered.
Conclusions: Dimensions of the anterior chamber angle can be significantly influenced by Nd:YAG laser iridotomy in narrow angle european eyes. UBM examination is a viable tool for the quantitative evaluation of the anterior chamber angle before and after laser iridotomy.
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P226 ULTRASOUND BIOMICROSCOPY IN PRIMARY ANGLE CLOSURE THE EFFECT OF PILOCARPINE AND NDYAG IRIDOTOMY ON THE ANGLE
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This was a prospective study to assess the angle in 32 eyes (16 patients) with proven narrow angles after instillation of pilocarpine. and after NdYAG laser. The measurement of trabecular-iris-angle (TIA), the trabecular iris surface area (TISA) and AC depth was done before and after instillation of pilocarpine and before and after NdYAG iridotomy. The patients were classified as those with an attack of angle closure and those with occludable angles. The average trabecular-iris-angle before pilocarpine was 9.8 degrees, after pilocarpine to 13 degrees. NdYAG laser iridotomy opened the angle a further 2 degrees and withdrawal of pilocarpine postYAG reduced this to slightly less than 14 degrees. The trabecular iris surface area also showed proportional changes and returned significant P values though the AC depth did not show significant changes. The UBM evaluation showed that both pilocarpine and YAG iridotomy had an affect on the peripheral angle but notmuch affect on the central AC depth. UBM evaluation is a useful test to quantitatively document the angles and decide on the future mode of treatment in eyes with narrow angles

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6.13. Clinical examination methods: Provocative tests

P227 CORRELATION OF STRUCTURE AND FUNCTION ASYMMETRY AND WATER-DRINKING TEST RESPONSE

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Purpose: To determine whether there is correlation between scanning laser polarimetry nerve fiber index (NFI) and water-drinking test (WDT) response.
Design: A retrospective analysis.
Participants: 49 primary open angle glaucoma patients.
Methods: A retrospective analysis of 49 primary open angle glaucoma patients submitted to scanning laser polarimetry with variable corneal compensator (SLP) and water-drinking test (WDT). All included patients were under same clinical therapy in both eyes and had SLP nerve fiber index (NFI) asymmetry (defined as a minimum 25% difference between both eyes). Differences in IOP measurements before WDT were £ 2 mmHg between both eyes in all subjects. IOP peak and IOP fluctuation obtained with the WDT were compared between eyes. SITA standard achromatic automated perimetry was also performed and compared between eyes by mean deviation (MD) index.
Results: Better and fellow worse eyes presented mean NFIS of 25.79 ± 11.01 and 41.87 ± 19.29 respectively ($p<0.0001$). Mean visual field MD value was5.46 ± 6.36 db in eyes with higher NFI values and 3.01 ± 4.67 db in eyes with lower NFI values ($p =0.032$). No significant difference between eyes was observed in IOP measurements obtained before WDT. Mean IOP peak after WDT was 21.53 ± 3.86 mmHg in eyes with higher NFI and 19.37 ± 3.77 mmHg in eyes with lower NFI ($p = 0.0061$). A significant difference in mean IOP fluctuation (maximum IOP minimum IOP after wdt) was also observed between eyes (5.16 ± 2.23 mmHg for eyes with higher NFI versus 3.54 ± 1.91 mmHg for eyes with lower NFI, $p=0.0002$)
Conclusions: Eyes with worse NFI obtained from scanning laser polarimetry presented higher IOP peak and higher IOP fluctuation after water drinking test. This study suggests that glaucomatous eyes with worse structural damage are less able to deal with transient IOP elevation.

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P228 THE INFLUENCE OF PHACOEMULSIFICATION ON WATER-DRINKING TEST

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Purpose: To evaluate the effect of cataract surgery performed by phacoemulsification on water drinking test results of non glaucomatous eyes. This test has been used to asses IOP peaks and fluctuations.
Participants: Twenty-five patients submitted to cataract surgery by phacoemulsification.
Methods: Prospective and consecutive study of 25 patients submitted to cataract surgery by phacoemulsification. Intraocular pressure was evaluated by water-drinking test (WDT) before and after 3 months of surgery and

compared with fellow unnoperated non glaucomatous eyes. Eyes with intraoperative and post operative complications such as vitreal loss and persistent corneal edema after surgery were excluded.
Results: Baseline IOP in operated eyes was 14.12 ± 3.0 mmHg before surgery and 12.6 ± 2.53 mmHg after surgery (p<0.0001). In these eyes peak IOP during WDT was 19.24 +/- 4.77 before surgery and 16.2 ± 3.57 mmHg after surgery (p<0.0001). A significant difference was also observed in IOP fluctuation before and after surgery (5.12 ±3.16 mmHg and 3.6 ± 2.04 mmHg, respectively; p=0.0071). No significant difference was observed in baseline IOP measurements obtained in nonoperated eyes before and after surgery (14.2 ± 2.8 mmHg versus 14.04 ± 2.60 mmHg, respectively; p=0.58). In these eyes no significant difference was observed in peak IOP measurements obtained before and after surgery (18.68 ± 3.85 versus 18.36 ± 3.69 mmHg, respectively; p=0.18). IOP fluctuation before and after surgery was 4.48 ±2.56 and 4.32 ± 2.26 mmHg, respectively (p=0.60).
Conclusions: Baseline IOP, IOP peak and IOP fluctuation obtained from water drinking test are lower in non-glaucomatous eyes after phacoemulsification for at least 3 months.
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P229 COMPARISON OF WATER DRINKING TEST AND IBOPAMINE TEST IN PRIMARY OPEN ANGLE GLAUCOMA

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Purpose: Ibopamine test and water drinking test (WDT) are provocative methods leading to transient increase of IOP. This study evaluated both tests in primary open angle glaucoma (POAG) patients to assess the interchangeability of results.
Design: Case series.
Participants: Fifty-five eyes of 55 POAG patients were included in this study (32 women, 23 men, mean age = 61.68 ± 13.66 years). Intervention or methods or testing: charts from consecutive patients with POAG submitted to wdt and ibopamine test in the same day were reviewed. All subjects were under clinical therapy.
Main outcome measures: True agreement between methods in measuring IOP peak was assessed using Bland-Altman graphs. IOP variation with either test was divided into three equally-numbered tertiles and classified as 'low' (IOP variation £ 3 mmHg), 'moderate' (3 mmHg < IOP variation £ 6 mmHg) and 'high' (IOP variation > 6 mmHg) and agreement between methods in this classification was assessed using k statistics.
Results: No significant differences were observed in baseline IOP before each test. Figure shows Bland-Altman plot of the agreement in IOP peaks between WDT and ibopamine test. The difference (WDT IOP peak ibopamine test IOP peak) was plotted against the average of the two measurements for IOP peak. The inspection of the scatterplot reveals a considerable discrepancy between the IOP measurements obtained by the two methods. The 90% confidence interval for IOP peak difference was between 6.7 mmHg and 6.6 mmHg. In 45.3% of the studied eyes, the IOP peak difference between the two tests was higher than 2 mmHg. There was poor agreement in classification of IOP variation obtained with both provocative tests (k < 0,4).
Conclusion: A large range of differences was observed in the results obtained from water drinking test and ibopamine test in primary open angle glaucoma patients of this study. Our findings suggest that these tests are not interchangeable, despite the fact that they are provocative methods.
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P230 POSTURAL CHANGES OF INTRAOCULAR PRESSURE AND THEIR IMPACT ON RETINAL GANGLION CELL FUNCTION

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Purpose: To evaluate changes of retinal ganglion cell (RGC) activity as measured by the pattern electroretinogram (PERG) in response to posture-related autoregulatory changes of intraocular pressure (IOP) and ophthalmic perfusion pressure (OPP).
Methods: Subjects were 31 normal subjects (mean age 34

± 12 years). IOP, systemic blood pressure (BP) and PERG were automatically and non-invasively measured at different angles of body position obtained with an electronically-adjustable tilting bed. IOP was measured by means of a non-contact tonometer (Reichert PT-100); PERG was recorded simultaneously from both eyes by means of skin electrodes (Pergla Paradigm, Porciatti and Ventura, 2004). OPP was calculated as the difference between the estimated mean ophthalmic artery pressure (OAPM) and the IOP.
Results: Compared to sitting position, increased angle of body tilting resulted in a progressive increase of IOP (-10 deg head-down: +19%, sd 21;30 deg head-down +111%, sd 38, n=8 subjects, 16 eyes). Sequential (10 minutes apart) measurements of IOP, PERG and BP were systematically (n=25 subjects, 50 eyes) carried out in 3 conditions: seated (baseline),10 deg head-down (Trendelenburg), and seated (recovery). In the Trendelenburg condition, significant changes (paired t-test, $p<0.01$) were found for IOP (+2.83 ± 2.8 mmHg, +20%) and PERG amplitude (-0.2 ± 0.29 µv,16%). In the recovery condition, IOP and PERG were not significantly different from baseline. Estimated OPP changes critically depended on the coefficients used to calculate OAPM. Using Sayegh and Weigelin, 1983 ophthalmodynamometric coefficients, no significant changes in opp occurred in trendelenburg position.
Conclusions: Autoregulatory changes of IOP in response to changes of posture induce measurable and reversible reductions of RGC function in normal subjects. This non-invasive protocol may disclose impaired autoregulation in glaucoma suspects, which manifests as disproportionate PERG reduction and longer time to recovery.

6.19. Clinical examination methods: Telemedicine

P231 THE EGS GLAUCOCARD PROJECT: A MULTINATIONAL STANDARDIZED DIGITAL GLAUCOMA PATIENT RECORD PROVIDING A TELECONSULTATION NETWORK

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Background: There are no standardized cross-national datasets for the documentation of medical data and disease history of glaucoma patients. Ophthalmologists and patients have no possibility to transfer disease history or raw examination data from one ophthalmologist to another in a simple, digitalized manner. Therefore, many examinations are repeated and important information can get lost.
Purpose: To evaluate existing international IT-based ophthalmological medical data projects and to define different stages of glaucoma data sets on existing international standards of medical and ophthalmological documentation. To develop the technical environment for easy data mining and data exchange in different countries in europe and to build a teleconsultation system.
Methods: Existing clinical and IT-based projects for documentation of medical data in ophthalmology (e.g. Opthel, ICD, SNOMED, LOINC, IEE, EGS guidelines) were analyzed to create new data sets for medical documentation in glaucoma patients. Different types of data transfer methods were evaluated to find the best way of data exchange between ophthalmologists in different european countries and to create a glaucoma specialists teleconsultation system.
Main outcome measure: Digital datasets were created and evaluated with different data items regarding general data, general history, ophthalmic history, examination findings and additional attached graphical information (visual field, HRT, GDX, FDT, RTA). A framework for secure storing and sharing digital glaucoma related data was compiled.
Results: Data sets from existing it projects showed a wide variability in specifications, use of codes, terms and graphical data (perimetry, optic nerve analysis etc.) In glaucoma patients. New digital datasets for glaucoma patients were defined based on existing standards with different levels of specification which can be used from general ophthalmologists for follow up examinations and for glaucoma specialists to perform teleconsultation also across country borders. Datasets are available in English, German, Spanish, Italian and Flemish. Different types of data exchange methods using secure medical data transfer by internet, USB-stick and smartcard were tested for different countries regarding legal acceptance, practicability and technical realization (e.g., compatibility with electronic-medical-record-systems).
Conclusion: By creating new glaucoma specific cross-national datasets it is now possible to develop an electronic glaucoma patient record system for data storage and transfer based on internet, smartcard or USB-stick. The digital data can be used in referrals and for teleconsultation of glaucoma specialists for optimizing glaucoma treatment. This should lead to an increase of quality in glaucoma care and prevent expenses in health care costs by unnecessary re-examinations.
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6.20. Clinical examination methods: Progression

P232 CORRELATION BETWEEN THE INITIAL VISUAL FIELD SENSITIVITY AND RATE OF VISUAL FIELD LOSS IN GLAUCOMA

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Purpose: To correlate the mean sensitivity of the whole central visual field and seven different regions of the field at the beginning of the study, with the slope of regression line of visual field over time.
Methods: A minimum of five visual fields were performed with an octopus 500ez using program g1 (threshold strategy)

over a mean of four year period in 64 patients (114 eyes) with primary open angle glaucoma. The rate of change of the whole central visual field and each of seven regions of the field were measured by linear regression analysis of the mean sensitivity value (DB) versus time (months), the mean sensitivity of the whole central visual field as well as of the each field region at the beginning of the study (initial sensitivity) was correlated with the slope of the regression line of the corresponding field region. Spearman rang correlation coefficient and the Spearman probability p values were calculated.
Results: The initial mean sensitivity of the whole central visual field was 19.22±6.39DB. The highest mean sensitivity was recorded in central region (22.49±6.57DB), whereas the lowest mean sensitivitys were found in nasal (17.64±8.01DB) and upper-nasal (17.68±7.64) regions. The slope of the regression line for the whole visual field during the mean follow-up period of 48.85±17.84 months, was 0.02±0.09 DB/months. The slopes had negative values in all seven regions of the visual field. Correlations between the initial mean sensitivity and the slope of the linear regression line in each field region were negative (negative value of Spearman correlation coefficient), indicating that lower initial sensitivity was associated with higher rate of visual field loss. The best correlation between the initial mean sensitivity and slope of regression line of visual field was determined in regions with the lowest mean sensitivity: in the upper-nasal region (Spearman r=0.181, p=0.053) and in the nasal region (Spearman r=0.173, p=0.065).
Conclusion: The study shows that lower mean sensitivity value of visual field, especially in nasal and upper-nasal visual field region, carries the grater risk for progressive visual field loss over time in glaucoma patients.
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6.30. Clinical examination methods: Other

P233 OCULAR BIOMECHANICAL PROPERTIES IN PRIMARY OPEN ANGLE GLAUCOMA AND NORMAL TENSION GLAUCOMA

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Purpose: To determine and compare the ocular biomechanical properties between eyes with primary open angle glaucoma (POAG) and eyes with normal tension glaucoma (NTG).
Design: Prospective cross-sectional study.
Participants: Eligible adult POAG and NTG patients attending the Glaucoma Clinic at the Aberdeen Royal Infirmary.
Methods: Prospective cross-sectional study from 1st October 2006 to 28th February 2007. Consecutive eligible patients attending the Glaucoma Clinic had assessment of their ocular biomechanical properties using the Ocular Response Analyser (ORA) by an observer masked to the diagnosis. NTG was defined with a maximum intraocular pressure (IOP) lower than 22 mmHg on Goldmann applanation tonometry. Exclusion criteria included previous intraocular surgery, ocular conditions affecting the cornea, inflammatory connective tissue disease, and refractive spherical equivalent of 4 dioptres or over. If both eyes were eligible, then the right eye was used for analysis. Comparison of means was done with the unpaired t-test.
Main outcome measures: Corneal hysteresis (CH) and corneal resistance factor (CRF) measurements.
Results: Eighty-one Caucasian patients were analysed. 40 had NTG, while 41 had POAG. 35 were females. There was no statistical difference regarding mean age (NTG 69.3 ± SD 9.6 years; POAG 69.0 ± SD 9.1 years) and mean CCT (NTG 536.8 ± SD 35.4 µm; POAG 541.0 ± SD 38.2 µm). The difference in mean CH (NTG 9.6 ± SD 1.3 mmHg; POAG 9.0 ± SD 1.4 mmHg) was statistically significant (p= 0.04). The difference in mean CRF measurements (NTG 9.9 ± SD 1.4; POAG 10.8 ± SD 1.6) was also statistically significant (p = 0.01).
Conclusions: There was statistically significant difference in the CH and CRF measurements between POAG and NTG. CH measurements, which may indicate the degree of corneal viscoelasticity, were higher in NTG. In contrast, CRF measurements, which may indicate the degree of corneal elasticity, were higher in POAG. This suggests that ocular biomechanical propertices may therefore be important factors in the development and progression of NTG.
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P234 PREDICTIVE VALUE OF ANTERIOR CHAMBER VOLUME ON SCHEIMPFLUG IMAGING IN EYES WITH NARROW ANGLE

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Purpose: To evaluate the predictive value of anterior chamber volume on pentacam as a screening tool for narrow angles.
Design: A clinic-based comparative, prospective, non-interventional study.
Participants: Seventy five consecutive normal subjects (spherical equivalent of ±1 d and no other ocular pathology) with BVCA of 20/20 both eyes were prospectively enrolled.
Methods: Subjects underwent routine slit lamp biomicroscopy, gonioscopy (angle grading was done using modified Schaffer's classification) and Scheimpflug imaging on pentacam (25 scan protocol) for evaluation of anterior chamber volume (ACV), central internal anterior chamber depth (ACD), PACD in all quadrants at 4 mm and 8 mm. The two observers were masked to each other's findings. The statistical analysis was done using Pearson's correlation test, paired t test.
Main outcome measures: Sensitivity, specificity, likelihood ratio and predictive values of acv set at cut off of 110 mm^3 for primary angle closure was calculated.
Results: Thirty two eyes had average angular width of >2 (open angle) and forty three eyes had <2 average angular width on gonioscopy (narrow angles). For all grades of angle on gonioscopy, the paired differences for anterior chamber volume were statistically different ($p<0.05$). The most significant were ACV for angles grade 2 versus angle grade 3 ($p=0.002$) and grade 4 ($p=0.005$) while for ACD, significant difference was observed in eyes with grade 1 versus grade 3 and grade 2 versus grade 3 ($p<0.01$). The mean ACV for grade 0 angle was 88.6 (11.9) mm^3, grade i was 99.6 (13.6) mm^3, grade 2 was 111.7 (27.67) mm^3, grade 3 was 157.5 (36.1) mm^3 and grade 4 was 214 (1.41) mm^3. The sensitivity of ACV at a cut-off of 110 mm^3 (ACV <110 mm^3 is narrow angle) for detecting narrow angles was 88.37%, specificity of 90.62%, positive predictive value 92.7%. Patients with ACV<110 mm^3 are 9 times more likely to have narrow angles.
Conclusion: Anterior chamber volume on pentacam has very high predictive value and acceptable sensitivity and specificity for detecting eyes with narrow angles. Pentacam imaging is a simple, easy to use, repeatable, reliable tool and has a definite value for quick screening for eyes with narrow angles.
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P235 PENTACAM EVALUATION OF CHANGES IN ANTERIOR CHAMBER DEPTH AND VOLUME IN CASES WITH PRIMARY ANGLE CLOSURE AFTER INSTILLATION OF PILOCARPINE

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Purpose: To quantify the effects of pilocarpine on peripheral anterior chamber depth (PACD), central internal anterior chamber depth (ACDd) and anterior chamber volume (ACV) using Pentacam Scheimpflug imaging system in eyes with primary angle closure (PAC).
Design: Institutional, interventional, non-randomized study.
Participants: Sixty-eight eyes of 68 patients with primary angle closure (PAC) were enrolled.
Methods: The anterior ocular segment was imaged with Pentacam Scheimpflug system using 25 image acquisition scan protocol. It analyzed the data from 12500 points ranging from the optical axis to the limbus. PACD, central ACD and ACV measurements were used for analysis. PACD was calculated from 4 mm and 8 mm at 3'0, 6'0, 9'0 and 12'0 clock hours. The pre and post pilocarpine measurements for PACD, ACD and ACV were analyzed using one-way anova and post hoc analysis.
Main outcome measures: Change in ACD, PACD-4, PACD-8 and ACV after pilocarpine instillation.
Results: There were 15 males and 53 Asian Indian females included. Mean age was 57.25 years (±9.2; range 39-80 years). Pilocarpine does not cause significant shallowing of ACD ($p=0.06$). Pilocarpine caused a significant shallowing of peripheral acd in each quadrant at 4mm but not at 8 mm ($p>0.05$). After pilocarpine there was insignificant ($p=0.272$) decrease of ACV by 5.19 mm^3 though acv change following pilocarpine had a linear correlation with baseline ACV. Paired t test showed a statistically significant difference ($p<0.01$) in the PACD at 4 mm and 8 mm at 3'0, 6'0, 9'0 and 12'0 clock hours.
Conclusion: Pilocarpine caused significant shallowing of peripheral anterior chamber depth. Pentacam is a promising tool for objective and quantitative estimation of anterior chamber biometry in PAC.
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P236 GLAUCOMA DETECTION USING AN ARTIFICIAL NEURAL NETWORK

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Purpose: To train and test the artificial neural network (ANN) for glaucoma detection.
Design: A clinic based non-interventional, cross sectional study.
Participants: Eighty eyes were classified using optic disc and perimetry into normal (n=24), primary open angle glaucoma (POAG) suspects (n=24) and POAG (n=32).
Methods: Easynn-plus (v6.0g) simulator was used to develop the ann model. Input layer had 114 nodes which included the data for age, sex, myopia, intraocular pressure, optic nerve head parameters on optical coherence tomography (OCT), Octopus 30-2 full threshold program, GDX parameters and retinal nerve fiber layer (RNLF) thickness using fast RNLF program on OCT. The data was analyzed for accuracy with two and three outputs. The classification model was cross validated using 20 eyes (normals=5 ;POAG suspects=8; POAG=7).
Main outcome measures: Sensitivity and specificity of ANN developed for glaucoma detection.
Results: With two outputs, the specificity was 80% and sensitivity was 93.3%. In this analysis it labeled 90% suspects as abnormal. It assigned the highest importance to smax/imax RNLF on OCT followed by cup area (OCT) and other RNLF parameters on OCT for 2 outputs. With 3 outputs, the ANN gave an overall classification rate of 65%, specificity (60%), and sensitivity of 62.5%-71.4% at target error rate of the training set of 1%. The parameters in decreasing order of relative importance for three outputs were SAVG (OCT), vertical cup disc ratio (OCT), cup volume (OCT) and cup area (OCT).
Conclusion: An ANN classification model, taking varied inputs from various glaucoma diagnostic instruments, was able to separate glaucomatous from normals with a high degree of accuracy. The accuracy drops with increasing outputs and has a tendency to mislabel POAG suspect as POAG.
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P237 CORNEAL SENSITIVITY IN GLAUCOMA PATIENT

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Purpose: To evaluate the effect of various topical drug(s) and/or surgery(s) in corneal sensitivity in glaucoma patients.
Design: Cross-sectional study.
Participants: One hundred sixty two eyes from 107 patients were enrolled in this study. Eighty one eyes were enrolled for each group. Treatment group was defined as glaucoma patients receiving topical drug(s) and/or surgery(s). Control group were healthy subjects with age and sex matched.
Methods: Corneal sensitivity is examined by cochet-bonnet aesthesiometer for each patient. The following data were recorded for every patient: sex, age, type of glaucoma, type and number of treatment or surgery and diabetes mellitus.
Main outcome measures: Corneal sensitivity.
Results: There were no statistically difference between groups in age, sex, status of dry eye and diabetes mellitus. Corneal sensitivity were significantly different between treatment and control group (p=0.000). No significant differences in corneal sensitivity were observed for various treatments of glaucoma. We also found no statistically difference between patients who receive timolol and other drug(s) (p=0.976). Duration of topical treatment gave no significant difference in corneal sensitivity. Trabeculectomy and other anterior segment surgeries did not give statistically difference in corneal sensitivity (p=0.816).
Conclusion: Corneal sensitivity in glaucoma patients receiving topical drug(s) and/or surgery were lower than healthy subjects. Duration and type of glaucoma treatments gave no significant differences in corneal sensitivity.
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8. REFRACTIVE ERRORS IN RELATION TO GLAUCOMA

8.4. Refractive errors in relation to glaucoma: Refractive surgical procedures

P238 CENTRAL CORNEAL THICKNESS, ABLATION AND CORNEAL CURVATURE AFTER CORNEAL REFRACTIVE PROCEDURE AND ITS IMPACT ON INTRAOCULAR PRESSURE MEASURES

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Purpose: Purpose number one: to assess the effects of central corneal thickness (CCT), ablation and corneal curvature after corneal refractive procedure on the intraocular pressure (IOP) measurement by Goldmann applanation tonometry. Purpose number two: to create a correction formula to determine the real IOP after corneal refractive procedure.
Methods: This prospective clinical trial comprised 156 eyes of 81 patients that underwent corneal refractive procedure. Preoperatively and 1 month (for lasik procedure) or 4 months (for alcohol assisted PRK) postoperatively, IOP, and corneal topography with orbscan ii (bandl) were evaluated. The parameters considered were mean keratometry (KM), central corneal thickness (CCT) and posterior curvature (postc).
Results: Due to the corneal refractive procedure, IOP was reduced from 14.6 32.8 mmHg to 12.732.8 mmHg; CCT was reduced from 533.3335.4 micra to 485.8351.7 micra; the postc was changed from 0.02630.010 to 0.03730.017 and the KM was changed from 43.331.5 dp to 41.331.9 dp. The difference between pre- and postoperative measurements were statistically significant ($p<0.001$). Among the possible predictor variables included in a multivariable regression model, four factors remained significantly and independently associated with pre-operative IOP measurement ($p<0.002$): post-IOP, ablation, post-CCT and post-KM. Pre-operative IOP can be estimated from the multivariable model with the formula: pre-IOP=16.236 + 0.464 post-IOP + 0.044 ablation+ 0.014 post-CCT+ 0.380 post-KM; or pre-IOP= 8.086 + 0.526 x post-IOP if only post-IOP is accessed.
Conclusions: The IOP measurements were reduced after corneal refractive procedure (2.032.7 mmHg). There were found two predictive models of the real IOP after corneal refractive surgery. However these model cannot be immediately translated to the clinical practice.
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P239 REFRACTIVE SURGERY FOR PATIENTS WITH GLAUCOMA

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Purpose: To evaluate the stability of the results of PRK. and lasik depending on the refraction, by comparing the patients with glaucoma with the ones without.
Methods: We studied 38 eyes of patients with glaucoma compensated by medical treatment which had benefited by refractive surgery: 18 myopic eyes (10 lasik and 8 PRK) and 20 hyperopic eyes. Lasik surgeries were performed for myopic eyes between3 d and8 d and hyperopic eyes between +3.5 d and +6 d. PRKsurgeries were performed for myopic eyes below3 d and hyperopic eyes below +3.5 d. We performed refractive surgery for the same refractive problem for eyes without glaucoma and we compared the results after 1, 2 and 3 years for the people from both categories. The surgeries were performed by the same surgeon in similar conditions.
Results: After 1, 2 and 3 years, we observed a very good stability of the results of the surgery at all the patients who had benefited by PRK. For patients with hyperopia greater than +5 d who had benefited by lasik, regression was quite significant both at the patients with glaucoma and the ones without it, with no particular difference between them. Regression seems to be more important to the patients with myopia and glaucoma than to the ones with myopia, but no glaucoma.
Conclusion: PRK has similar results at the patients with small dioptrics, irrelevant to the presence of glaucoma. Lasik has good results at the patients with glaucoma, but the regression rate seems to be greater, especially at myopic eyes.

P240 COURSE OF INTRAOCULAR PRESSURE (IOP) IN EYES AFTER IMPLANTATION OF PHAKIC POSTERIOR CHAMBER IOLS (VISIAN ICL) FOR CORRECTION OF HIGH MYOPIA

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Purpose: To evaluate short-term and long-term intraocular pressure changes after implantation of phakic posterior chamber intraocular lenses (Visian ICLS) with simultaneous surgical iridectomy.
Design: Prospective, noncomparative, interventional case series.
Participants and/or Controls: Thirty-four eyes (24 myopic, 10 astigmatic eyes) of 19 patients aged between 19 to 58 years were included.
Methods: Visian ICL and Visian TICL (implantable contact lens, Staar Surgical inc., Nidau, Switzerland) were implanted for the correction of high myopia (-9.5 bis16,25 d, mean:13,04 d) and astigmatism (1.75 bis 3.75 d, mean: 3.125 d). Simultaneously a surgical peripheral iridectomy was performed in all eyes for prevention of pupillary block glaucoma.
Main outcome measures: Intraocular pressure (IOP) was determined using Goldmann applanation tonometry preoperatively, early postoperatively and at 1, 3, 6 months, and at 1 to 6 years after implantation of the ICL.

Results: mean preoperative IOP was 13.8 mmHg ± 2,33 (sd) (range 11-19 mmHg), mean early postoperative IOP was 14,3 mmHg ± 2,68 (SD) (range 12-20 mmHg), and mean late postoperative IOP was 14,7 mmHg ± 2,1 (SD)(range 12-20 mmHg).
Conclusions: Elevation of IOP is considered as a possible complication following implantation of a phakic posterior chamber intraocular lens like the Visian ICL. Pigment dispersion syndrome, pupillary block glaucoma and narrowing of the angle are discussed as possible mechanisms. Therefore, two peripheral laser iridotomies are recommended before surgery to prevent pupillary block glaucoma. In our case series no statistically significant increase of IOP could be observed. We suggest that the functioning surgical iridectomy as in our patients may prevent postoperative glaucoma in such patients.
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9. CLINICAL FORMS OF GLAUCOMAS

9.1.1. Clinical forms of glaucomas: Developmental glaucomas: Congenital glaucoma, Buphthalmos

P241 ULTRASOUND BIOMICROSCOPIC CHARACTERISTICS OF ANTERIOR SEGMENT IN PRIMARY CONGENITAL GLAUCOMA

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Objective: To qualitatively and quantitatively evaluate ultrasound biomicroscopic (UBM) features of the anterior segment in eyes with primary congenital glaucoma.
Design: Case-controlled observational study.
Participants and controls: Forty-five eyes of primary congenital glaucoma and 40 controls were included in this study.
Methods: UBM of 45 eyes of previously operated patients > 5 years of age were studied and correlated with ocular biometry. The iris thickness, ciliary body thickness, ciliary body lens distance, posterior chamber depth and anterior chamber angle were measured and compared with normal control eyes. Other features of anterior segment were qualitatively evaluated.
Main outcome measures: Axial length, corneal diameter, morphology of the anterior segment including the angle structure and ciliary body.
Results: A thin splayed rarefied ciliary body and abnormal tissue at iridocorneal angle were features seen in 90% of UBM scans. Iris hypoplasia and stretched zonules correlated with the axial length (p=0.04) but not with the mean corneal diameter.
Conclusions: Characteristic anterior segment dysplasia and ciliary body anomalies should be kept in mind while operating primary congenital glaucoma eyes.
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9.1.3. Clinical forms of glaucomas: Developmental glaucomas: Syndromes of Axenfeld, Rieger, Peters, aniridia

P242 PUPILLARY BLOCK IN PETERS ANOMALY

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Purpose: In Peters' anomaly, the anterior chamber angle is usually grossly normal even if the adhesion of the central corneal defect to the iris is severe. We now present a rare case of Peters' anomaly with a flattened anterior chamber caused by pupillary block.
Design: A case report.
Methods/Results: A 2-month-old infant presented with corneal leukoma in his right eye. Synechiae extending from the central iris to the periphery of the corneal opacity were apparent and the anterior chamber was flat. No abnormalities of the vitreous cavity or retina were detected by ultrasonography in the b-scan mode. The patient was thus diagnosed with unilateral Peters' anomaly. Intraocular pressure (IOP) of his right eye was 31 mmHg under general anesthesia. We attempted to form the anterior chamber by injection of balanced salt solution and trabeculotomy. Minimal formation of the anterior chamber was achieved and the iris root unexpectedly prolapsed through the ruptured trabeculum. The prolapsed iris was excised. Five days after surgery, IOP was 10 mmHg and a shallow anterior chamber was detected in the inferior portion of the right eye. After 2 months, IOP was 11 mmHg and the anterior chamber was deepening in all quadrants.
Conclusions: Given that the anterior chamber formed after peripheral iridectomy, pupillary block was the likely cause of the flat chamber in the patient. As far as we

are aware, this is the first report of Peters' anomaly with pupillary block.

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P243 NOVEL FUNDUS CONDITIONS IN AXENFELD-RIEGER SYNDROME: HETEROGENEITY OR CONTIGUITY?

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Purpose: To report a family of Axenfeld-Rieger (A-R) syndrome combined with novel fundus conditions.
Design: Case report.
Participants: The male proband, now aged 16 years old, is the third of three children born to unrelated Chinese parents. The proband was recognized 10 years ago and came this time complaining of view shading and floaters.careful check showed all three children and the father features typical prominent and anterior displaced Schwalbe's line attached by iris strands bilaterally. Malformation of the craniofacial structures included broad forehead, hypertelorism, maxillary hypoplasia. The affected father also had unilateral neurosensary hearing loss.
Methods: We examined all family members with slit lamp microscope, gonioscope, Goldmann tonometer, ophthalmofundoscope and ultrasound biomicroscopy (UBM). Fundus fluorescein angiography (FFA) was conducted unless it was contraindicated in two eyes of two patients.
Main outcome measures: The IOP readings of all family members were within the normal range. The right eye of the proband demonstrated superior retinal detachment with an atrophic hole sizing 5 PD between 11 to 3 o'clock and a 1/5pd one at 9 o'clock around the equator. Both of his sister had macular ectopia. Besides, the elder daughter was blind in her left eye without consulting a doctor several years ago. FFA of her right eye revealed spot-like dye leakage (triangle) and a lesion of subretinal hypofluorescent combined by transmitting fluorescence in inferotemporal periphery (black arrow). Around the lesion there was brushlike retinal vessels (white arrow).
Results: We referred the proband to fundus department for PPV assisted by intraocular laser coagulation and perfluoropropane injection. But unfortunately 2 weeks later the retinal detachment recurred which was reattached by silicone oil tamponade. The dye leakage case was followed up every 2 months and no progression was observed up to now.
Conclusions: The coincidence of A-R syndrome and novel fundus conditions was rarely reported. We are wondering if there should be something common underlying the pathogenesis of the two seemingly separate conditions.

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9.2. Clinical forms of glaucomas: Primary open angle glaucomas

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9.2.2. Clinical forms of glaucomas: Primary open angle glaucomas: Other risk factors for glaucoma

P245 PREVALENCE OF GLAUCOMATOUS RISK FACTORS IN PATIENTS FROM A MANAGED-CARE SETTING: A PILOT EVALUATION

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Objective: Glaucoma is a multifactorial disease and numerous studies have attempted to quantify risk factors. The purpose of this study was to determine the prevalence of glaucomatous risk factors (RFS) in glaucoma patients in a managed-care practice.
Design: Retrospective review of patient medical records.
Participants: Glaucoma patients (n=1189).
Methods: Diagnosis and documentation information of 15 RFS reported to be associated with glaucoma progression were collected. The 15 RFS included age > 70, family history, African American origin, high intraocular pressure (IOP), increase cup/disc (c/d) ratio, poor visual field score, disc hemorrhage, pseudoexfoliation sign, low central corneal thickness (CCT), high myopia, cardiovascular disease, systemic hypertension, diabetes mellitus (DM), migraine headache, and vasospasm.
Main outcome measures: The average risk score for the population was calculated using the predictive model based on 5 risk factors (age, IOP, CCT, c/d ratio, VF score, and DM) derived by Medeiros et al. (2005), where a higher score indicates greater risk.
Results: 1,182 of 1,189 patients for which medical records were available had a clear diagnosis in the charts. Mean age (63.0 ± 11.9 years) and the average IOP (18.3 ± 4.7

mmHg) was calculated. Average value of c/d ratio was 0.52 ± 0.18, pattern standard deviation was 2.59 ± 1.99 db, and CCT was 552 ± 34 microns. The glaucomatous RF with the highest incidence was systemic hypertension (39.0%), followed by age > 70 (27.2%), DM (23.6%), African American origin (23.0%), and a family history of glaucoma (18.2%). An average risk score was 42 for this population. Three of the 5 most prevalent glaucomatous RFS from this population were not included in the predictive model.
Conclusions: The prevalence of RFS and risk scores may be compared with a non-glaucoma patient population or a population of glaucoma patients without glaucomatous RFS to determine the relative risk difference. Existing models for calculating glaucoma risk scores do not consider several important risk factors, and these variables should be considered in future calculation models.
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P246 COMPARATIVE STUDY OF INCIDENCE OF DISC HEMORRHAGE BETWEEN OPEN ANGLE GLAUCOMA WITH MYOPIC AND NON-MYOPIC TYPE DISC.

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Purpose: Disc hemorrhage (DH) is an important prognostic sign in open angle glaucoma (OAG), and the prevalence of DH is higher in normal pressure glaucoma. No previous longitudinal studies, however, addressed correlation of DH and disc appearance. We compared the incidence of dh by optic disc appearance (myopic versus non-myopic type).
Design: A prospective, follow-up, case-control study.
Methods: Eighty three eyes of 83 OAG patients were included in this study (age: 20-65years, mean deviation [md] >-15db, refractive error 10d, follow-up period: 45.0±12.0 [mean±standard deviation] months), excluding the eye with worse md when both eyes met inclusion criteria. We classified optic disc appearance into 'myopic' and 'non-myopic' type according to Nicolela and Drance. Disc appearance were judged by 8 glaucoma specialists in a masked fashion without referring refractive error to obtain unanimous consensus. Cases with systemic hypertension or diabetes were excluded, and 43 eyes (26 males and 17 females) as myopic and 40 eyes (21 males and 19 females) as non-myopic type (focal ischemic: 3 eyes, general enragement: 37 eyes, senile sclerotic: none) were included. Age (47.8 and 51.5 years on an average, respectively) , intraocular pressure (IOP) at entry (14.7 and 14.9 mmHg) and percentage of normal pressure glaucoma included (83.7 and 67.5%) showed no intergroup difference, while refractive error was different (-6.0 d and 2.0d, p<0.0001). Each patient underwent ophthalmic examination including careful optic disc observation every 6-8 weeks and Humphrey field examination every 6 months. The subjects were treated with topical latanoprost, timolol and/or dorzolamide if necessary.
Results: There were significant difference in the percentage of eyes with DH during the follow-up (myopic: 11.6 %, non-myopic: 37.5 %, p=0.048: Fisher test) and probability of incidence of DH by life-table analysis was significantly lower in the eyes with myopic type disc than in those with non-myopic type disc (12.8±5.5%[se] vs 40.4±8.2 %, p=0.0056: log-rank test). No significant intergroup differences was seen in the md at entry (-4.9 and -4.4db on an average, respectively),md at the last visit (5.0 and -4.5 db), mean IOP during follow-up (13.8 and 13.6 mmHg) or a number of prescribed eye drops. Likewise, there was no significant difference in any parameters between focal ischemic and general enlargement type disc.
Conclusions: The incidence of DH was significantly lower in OAG eyes with myopic type disc than in those with non-myopic type disc which suggests some difference in the damaging process between the two.
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P247 ASSOCIATION OF SMOKING AND TOBACCO CHEWING WITH INTRAOCULAR PRESSURE IN A POPULATION BASED STUDY

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Objective: To analyze the association of life style issues (smoking, tobacco chewing, alcohol consumption, occupation, age groups and rural vs urban status) and intraocular pressure (IOP) in Chennai Glaucoma Study (CHS).
Design: Prospective cross-sectional survey.
Participants: 7774 (rural - 3924; urban - 3850) enumerated subjects from the Chennai Glaucoma Study in South India.
Methods: Complete ophthalmic examination including demographics (included life style issues), applanation tonometry and detailed glaucoma evaluation was performed. Tobacco chewing included paan use. Occupation was categorized as agriculture, cottage industry, unemployed and business firms. Age groups 50 and above in decades were compared to 40-49 years. Paired t-test, chi-square test for demographics; Pearson correlation coeffficient and multivariate logistic regression analysis were applied.
Main outcome measures: Correlations of IOP and life style issues, adjusted odds ratio for IOP > 23 mmHg.
Results: Age groups (r=0.032), smoking (r = 0.07), alcohol consumption (r = 0.047) and tobacco chewing (r =

0.117) showed weak positive correlation but statistically significant association with IOP (p=0.0). Adjusted odds ratio for smoking (1.52; 95%ci ' 1.03-2.25), tobacco chewing (1.67; 95%ci ' 1.14 ' 2.46), urban status (2.8; 95%ci ' 2.1 ' 3.73) and increasing age groups (1.99 ' 3.22) suggested significant association with IOP >23 mmHg.
Conclusion: Smoking, tobacco chewing, older age and urban status may affect IOP level in South Indian population.
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9.2.4. Clinical forms of glaucomas: Primary open angle glaucomas: Normal pressure glaucoma

P248 CORNEAL HYSTERESIS, CORNEAL RESISTANCE FACTOR AND IOP COMPENSATED FOR CORNEAL EFFECTS IN NORMAL, OPEN ANGLE AND NORMOTENSIVE GLAUCOMA EYES.

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Objective: Prevailing methods of intraocular pressure (IOP) measurement cause systematic errors by corneal dimensions and biomechanical properties of the cornea. We measured intraocular pressure (IOP) by Goldmann equivalent IOP (IOPG), IOP compensated for corneal effects (IOPCC), corneal hysteresis (CH), corneal resistance factor (CRF) by Reichert's ocular response analyzer (ORA) as well as central corneal thickness (CCT) to see if these metrics provide useful information in diagnosis and management of glaucoma.
Design: Observational chart review.
Participants: A total of 4667 consecutive ORA measurements in 749 subjects in a general ophthalmology clinic were reviewed. Randomly selected one eye of each subject was extracted for analyses. Three hundred normal eyes, 300 primary open angle glaucoma (POAG) eyes and 149 normotensive glaucoma (NTG) eyes were selected.
Methods: IOPG, IOPCC, CH, CRF (in mmHg, abbreviated in result) and CCT were compared.
Main outcome measures: Normal eyes had IOPG 15.10 ± 3.22 (in mmHg are abbreviated hereafter), IOPCC 14.89 ± 3.51, CH 11.19 ± 1.63, CRF 10.46 ± 1.75, CCT 550 ± 39 µ. POAG eyes had IOPG 15.97 ± 5.26 (range 4.01-55.05), IOPCC 15.88 ± 5.02 (2.44-48.88), CH 10.08 ± 2.33 (2.07-19.96), CRF 9.30 ± 2.2 (1.70 24.18), CCT 551 ± 40µ. NTG eyes had IOPG 14.51 ± 3.38 (5.6-20.2), IOPCC 19.94 ± 3.59 (10.7-28.5), CH 5.91 ± 1.16 (2.2-8.1), CRF 6.31±1.10 (3.6-8.4), CCT 517 ± 39 (433-622) µ.
Results: CH and CRF of NTG eyes were significantly lower than those of POAG (p<0.001) and normal eyes (p<0.001). The difference between mean IOPG and mean IOPCC of NTG eyes (5.43 mmHg) were significantly higher than those of POAG and normal eyes (p<0.001).
Conclusion: NTG eyes had significantly thinner mean CCT of 517 µ with a wide variations of 433 to 622 µ. NTG eyes had significantly lower CH and CRF than POAG and normal eyes, indicating low viscous damping and viscoelasticity of the cornea of NTG eyes. Not only thinner cornea, but low viscoelasticity of the cornea may cause erroneously low IOPG and Goldmann applanation tonometry values, confounding the IOP measurement values. IOPCC of NTG eyes were significantly higher (by 5.43 mmHg) than IOPG. The difference between IOPG and IOPCC among NTG eyes were much higher than those among POAG and normal eyes. This apparently normal IOPG but higher IOPCC may cause delayed diagnosis and inadequate therapy in NTG eyes. IOPCC seems to be a measure of IOP less effected by corneal properties than IOPG or Goldmann applanatioin tonometry. Reichert's ora seems to provide significant metrics in the diagnosis, therapeutic target setting and management of glaucoma, especially for normotensive variety.

P249 TARGET PRESSURE DETERMINED IN PROGRESSIVE NORMAL-TENSION GLAUCOMA CASES

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Purpose: To determine a target IOP level in progressive normal-tension glaucoma (NTG) by evaluating visual field (VF) progression following trabeculectomy.
Design: retrospective, non-comparative study.
Participants: All consecutive cases (164 eyes of 115 patients) with NTG who underwent trabeculectomy with mitomycin C between 1990 and 2000, were retrospectively reviewed and 40 eyes of 40 patients who had significant progression of VF preoperatively, were selected based on the following criteria: best-corrected visual acuity >20/30, preoperative mean deviation (MD) >-20.00 dB, no eye diseases except NTG or postoperative complications which may affect VF, and postoperative follow-up period > 5 years (mean 12 years, range; 5.3-16.0 yrs).
Methods: Perimetric examination was periodically performed and progression was determined by two criteria: AGIS score deteriorated at least four, and significant negative MD slope by a linear regression model. Kaplan-Meier method was used to compare the VF stability in different IOP levels.
Main outcome measures: IOP reduction and postoperative visual fields stability. Preoperative mean MD was -13.38dB.The IOP was reduced from 15.2 to 9.4 mmHg in average by trabeculectomy (p<.0001). IOP<10 was attained in 60% of cases. 30% and 20% reduction of IOP were achieved in 23 (58%) and 29 (73%) of 40 patients, respectively. Cumulative probability of postoperative VF stability defined by the AGIS criterion was 96 % at 14 year-F/U in patients who achieved 30% reduction of IOP,

whereas it was 32 % in ones who did not (p<.0001: Log-rank test). When 20% IOP reduction was employed as a cut-off value, VF was maintained in 93% in the successfully controlled group, but all cases who failed showed progression (p<.0001).
Results: When IOP values such as 8, 9, 10, 11, 12 mmHg were employed as a cut-off, the best VF prognosis was attained by both progression criteria in cases with the postoperative IOP value of 10 mmHg. However, 8 % of patients with postoperative IOP<10 mmHg and/or achieved 30% reduction of IOP still had VF progression.
Conclusions: At least 20% reduction of IOP or IOP<10 mmHg is required as postoperative target IOP in NTG patients who had significant progression of VF preoperatively.

P250 C-REACTIVE PROTEIN AND LIPID PROFILES IN NORMAL TENSION GLAUCOMA

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Purpose: To compare c-reactive protein (CRP) levels and lipid profiles between normal tension glaucoma (NTG) patients and healthy controls.
Design: Cross-sectional study.
Participants: This prospective study included 57 patients with NTG and age-matched 57 healthy control subjects.
Methods: Each patient underwent Humphrey visual field examination and blood sampling for high-sensitive CRP (HSCRP) and lipid profile analysis. The patients were categorized into two groups based on their IOP levels. Group a (31 NTG subjects and 27 controls) had IOP of 14 or less, and group b (26 NTG subjects and 30 controls) had IOP more than 14mmHg.
Main outcome measures: HSCRP and lipid profiles between NTG patients and healthy controls in overall subjects and in each subgroups (Mann-Whitney u test).
Results: The overall NTG subjects showed significantly higher HSCRP values compared with healthy controls (p=0.005). Lipid profiles were not different between NTG subjects and controls. When the subjects were classified by IOP levels, NTG subjects had significantly higher HSCRP level than controls (p=0.001) for group a. In contrast, there was no difference in HSCRP level between NTG subjects and controls for group b (p=0.414). Lipid profiles were not different for both groups.
Conclusions: This study demonstrated that higher CRP levels may be associated with NTG, especially in relatively low IOP level, and that dyslipidemia may not be associated with NTG.
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9.3. Clinical forms of glaucomas: Primary angle closure glaucomas

P252 A QUANTITATIVE EVALUATION OF PUPILLARY BLOCK MECHANISM IN PRIMARY ANGLE CLOSURE

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Objective: Primary angle closure (PAC) in Asians is considered to be caused not simply by pupillary block mechanism but by multi-mechanism. However, no report has quantitatively evaluated the degree of pupillary block mechanism in PAC yet. We carried out quantitative evaluation of the degree of pupillary block in PAC in Japanese.
Design: Observational cross-sectional study.
Participants: Five hundred and fifty-four eyes of 293 patients: 95 eye of 59 patients with primary angle closure glaucoma (PACG), 173 eyes of 113 patients with PAC, and 286 eyes of 171 patients with primary angle closure suspect (PACS).
Methods: Configuration of the anterior chamber was examined with ultrasound biomicroscopy in eyes of the participants. The iris convexity (IC), which represents the grade of pupillary block parametrically, was measured.
Main outcome: IC value.
Results: The average IC value in the all eyes was 2.14 (standard deviation: 0.98) mm. The maximum IC value was 0.5 mm, and the minimum value was 0.0 mm. The distribution of number of the eyes for each IC value was as follows; 0.5 mm: 1 eye (0.2%), 0.4 mm: 37 eyes (6.7%), 0.3 mm: 172 eyes (31.1%), 0.2 mm: 187 eyes (33.8%), 0.1 mm: 140 eyes (25.3%), 0.0 mm: 17 eyes (3.1%). No significant difference was observed among eyes with PACG, those with PAC, and those with PACS for IC value.
Conclusions: There was considerable individual difference in the degree of pupillary block in eyes with PAC (including PACG and pacs), and the degree of pupillary block did not correlate with stages of the disease: PACS, PAC, and PACG. The present results indicate that PAC in Japanese is caused by multi-mechanism.
References:
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9.3.1. Clinical forms of glaucomas: Primary angle closure glaucomas: Acute primary angle closure glaucoma (pupillary block)

P253 ACUTE ANGLE CLOSURE GLAUCOMA IN TEENAGE GIRLS

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Background: Angle-closure glaucoma is rare in children and young adults, only scattered cases associated with specific clinical entities having been reported. Reported causes of angle closure: Glaucoma in teenage patients include posterior scleritis associated with the sturge weber syndrome, pigment epithelial cysts of the ciliary body with pupillary block and posterior scleritis.
Case report: A fourteen year old caucasian girl presented with a two day history of moderately severe left ocular pain associated with photophobia and blurred vision, which had started while watching television in dim light. She also reported an intermittent history of discomfort in the left eye over the past 2 years. There was no family history of glaucoma. At presentation, the visual acuities were 6/6 and counting fingers at one meter and the intraocular pressures measured 12 and 46 mmHg in right and left eyes respectively. The right anterior chamber angle exhibited a grade ii (Schaffer) appearance with a flat iris contour, whilst corneal oedema precluded effective gonioscopy in the left eye. On topical pilocarpine, timolol and intravenous acetazolamide the left IOP dropped to 20 mmHg. Bilateral nd:yag laser peripheral iridotomies were performed, immediately in the right eye and shortly upon restoration of corneal clarity in the left. The IOP subsequently dropped to 9 mmHg in the left eye and left vision improved to 6/12 unaided (6/6 with pin hole). The left anterior chamber angle appeared narrow (grade i) in three quadrants and closed in the superior quadrant, the iris contour appearing flat. The optic discs appeared healthy without glaucomatous damage. The axial lengths measured 21.29 mm and 21.03 mm in right and left eyes, whilst axial anterior chamber depth was measured at the slit lamp at 2.55 mm and 2.48 mm in right and left eyes respectively. The IOPs have subsequently remained stable in the mid-teens on no medication.
Comment: Angle closure glaucoma involves elevation of intraocular pressure secondary to apposition of the peripheral iris to the trabecular meshwork, often associated with abnormal anatomic relationships of the anterior segment structures. The uncommon occurrence of angle-closure glaucoma in a young individual should therefore prompt investigation into possible secondary causes for angle closure, including attention to a possible family history, since an occludable configuration of the anterior chamber angle may be inherited. In our patient, the history of sporadic ocular discomfort over the two years preceding acute angle closure indicates intermittent acute elevations of IOP. Whilst the flat iris contour is strongly suggestive of the plateau iris syndrome, the impressive and sustained ocular hypotensive response to laser peripheral iridotomy is more consistent with pupillary block.
Characteristic of primary angle closure glaucoma. It is perhaps enigmatic that the administration of long acting cycloplegic agents in hypermetropic children is so rarely associated with angle closure glaucoma. This condition can, however, occur in the young, as exhibited by our patient and in this context, this condition merits consideration as part of the differential diagnosis of acutely glaucomatous eye.

P254 OUTCOME OF PATIENTS PRESENTED WITH ACUTE PRIMARY ANGLE CLOSURE WITH OR WITHOUT GLAUCOMA IN SARAWAK GENERAL HOSPITAL, MALAYSIA FROM 1ST JANUARY 2004 UNTIL 31ST MAY 2006

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Objectives: The general objective was to evaluate the short term outcome of patients presented with acute attack of primary angle closure with or without glaucoma. The specific objective was to identify the methods of IOP control after successful laser peripheral iridotomy.
Design: Retrospective descriptive data analysis.
Participants: All patients presented with acute primary angle closure with or without glaucoma to the Ophthalmology Department of Sarawak General Hospital from January 1, 2004 until May 31, 2006.
Methods: The following parameters were taken into consideration: age of presentation, sex, race, date of onset of attack, duration from onset to arrival to ophthalmology department, intraocular pressure, IOP at presentation and at last visit, visual acuity at presentation and at last visit, and method of IOP control at date of last visit.
Main outcome measures: Methods of IOP control at last follow-up visit.
Results: In the 39 patients, 53.9 % presented with only right eye involvement, 33.3 % with only left eye involvement and 12.9% had bilateral, simultaneous attacks. Data of 44 eyes were available for analysis. The median duration of follow up was 179 days (range: 3 to 875 days). Female constituted 71.8 % of patients. The median age of patients was 67 years old. 43.6% of those affected were Chinese. The median duration from onset of symptoms to presentation was 7 days. Mean IOP at initial examination was 42.7 mmHg (sd, 12.7 mmHg; range, 17.75 mmHg). During the last follow-up, 75% of eyes had IOP below 20 mmHg, 52.3% had va 6/24 or better. 15.9% of eyes required no medication to control their iops, 25% required 1 anti-glaucoma medication. 22.7% require 2 anti-glaucoma medications, 9% required 3 medications, 2.3% required 4 medications, 22.8% required trabeculectomy and 2.3% required trabeculectomy plus a type of anti-glaucoma medication.
Conclusions: Socio-economic factors play a major role in determining the final outcome of our study.

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P255 PREVALENCE OF APPOSITIONAL ANGLE CLOSURE DETERMINED BY ULTRASONIC BIOMICROSCOPY IN THE FELLOW EYES OF ACUTE PRIMARY ANGLE CLOSURE IN CHINESE AFTER LASER PERIPHERAL IRIDOTOMY

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Objective: The intraocular pressure in primary angle closure (PAC) eyes after laser peripheral iridotomy (LPI) could increase with time because peripheral anterior synechia (PAS) of iris extend. PAS relates to appositional angle closure (AAC). This study is to investigate the rate of aac after LPI in PAC and the eye anatomic character in those eyes.
Design: Case-controlled study.
Participants: Forty-three patients of acute PAC with only one attacked eye and the fellow eye without any pas by gonioscopy after LPI.
Methods: Ultrasounic biomicroscopy (UBM) were performed on the fellow eyes of PAC patients in the dark. Qualitative assessment of AAC from the UBM images were taken.
Main outcome measures: The UBM-parameters were compared between the eyes of positive and negative AAC.
Results: Thirteen fellow eyes of PAC patients patients (38.2%) exist AAC at least one quadrant angle from the UBM-images. AOD500, ARA750, t-i angle, and TCPD (inferiorly and temporally) in the group of positive AAC were less than that in the group of negative AAC ($p \leq 0.01$). Lt1 in the group of positive AAC were more than that in the group of negative appositional angle closure superiorly and nasally (p=0.003, 0.048 respectively).
Conclusion: AAC still occurs in more than 1/3 of acute PAC patients in the dark after LPI. The narrow angle, anteriorly positioned ciliary body, thick peripheral iris are the anatomic characters responsible to AAC after LPI.
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9.3.4. Clinical forms of glaucomas: Primary angle closure glaucomas: Primary angle closure suspect

P256 PREVALENCE OF ANGLE CLOSURE IN BELARUS

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Purpose: To estimate prevalence of angle-closure and to reveal its associations with estimated glaucoma diagnosis, age and gender.
Design: Prospective comparative cohort-based study.
Participants: Overall 875 individuals from which 327 glaucoma patients and 548 non-glaucoma patients who attended out-patient clinic in 2006 were selected on the basis of study inclusion criteria. Inclusion criteria were defined as age older 50, transparent cornea and absence of cataract surgery and uveitis.
Method: Standard bilateral gonioscopy in scotopic conditions with Goldmann goniolens. Angle closure was defined as angle graded 0-1 under Shaffer classification in at least 180 degrees of at least one eye.
Main outcome measures: Prevalence of angle closure in patients studied.
Results: According to study definition angle-closure was found in 92 out of 327 glaucoma patients and in 38 out of 548 non-glaucoma patients. This consisted 28.1% and 6.9% respectively ($p<0.0001$). In the glaucoma group mean age of angle closure participants was 68,6 and open angle 68.5(p-0.87). In the non-glaucoma group mean age of angle closure was 70.0 and open angle 63.2 ($p<0.0001$). In the glaucoma group angle closure was found in 17.5% of males and 34.7% females ($p<0.0001$). In the non-glaucoma group angle closure was found in 5.2 % males and 8.0 % females (p-0.25).
Conclusions: Angle-closure was found to be significantly associated with glaucoma diagnosis, increasing with age and having female predilection. Females tends to convert from asymptomatic angle-closure to angle closure glaucoma more often than males.
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P257 RISK OF ACUTE ANGLE CLOSURE AND SPIKE IN INTRAOCULAR PRESSURE AFTER ROUTINE DILATION OF DIABETICS IN A SINGAPORE HOSPITAL

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Purpose: Although pupillary dilation carries a risk of acute angle closure (AAC) in subjects with narrow angles, some epidemiological studies have found that there was low risk for AAC with routine dilation of pupils for retinal examination. The aim of this study was to investigate the incidence of AAC and rise in intraocular pressure after routine mydriasis of new patients attending a diabetic retinopathy clinic in Singapore, a country with high prevalence of narrow angles.
Design: Prospective observational study.
Participants: 2004 consecutive new patients attending a diabetic retina clinic.
Methods: Consecutive new patients attending a diabetic retina clinic were routinely dilated with 1% tropicamide and 2.5% phenylephrine if presenting IOP was normal. Air puff tonometry was done to assess intraocular pressure before and 1 hour after dilation. Patients were also asked about symptoms of AAC within 24 hours of dilation. All subjects with raised IOP underwent further ophthalmic evaluation.
Main outcome measures: AAC and raised IOP.
Results: A total of 2004 consecutive new patients were enrolled. 10 subjects were excluded as they did not complete the protocol. For the remaining 1994 subjects, the mean age was 63.6 years and there were 933 males (46.8%). None (0%, 95%ci: 0 to 0.14%) of the patients who underwent routine dilation developed AAC. There were 38 subjects (1.91%, 95% ci: 1.31 to 2.51%) who developed a rise in IOP of > 5 mmHg in any eye after dilation but without signs of AAC.
Conclusions: In a country with high prevalence of angle closure, we found that the risk of AAC was low after routine dilation of pupils for retinal examination. 1.91% developed a rise in IOP > 5 mmHg.
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9.3.5. Clinical forms of glaucomas: Primary angle closure glaucomas: Primary angle closure

P258 SHORT-TERM RESULTS OF PROPHYLACTIC LASER IRIDOTOMY IN EYES WITH NARROW DRAINAGE ANGLES: A RANDOMIZED CONTROLLED TRIAL

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Purpose: To assess the short-term effect of laser iridotomy (LI) on anterior chamber configuration in primary angle closure suspects (PACS).
Design: Prospective randomized clinical trial.
Participants: Subjects over the age of 50 diagnosed as primary angle closure suspects in both eyes. PACS was defined as an eye where the posterior trabecular meshwork was not visible for at least 180º on non-indentation gonioscopy, intraocular pressure ≤ 21 mmHg, no peripheral anterior synechiae and no disc or field changes.
Intervention: Prophylactic sequential LI was performed in one randomly selected eye, while the fellow eye served as a control.
Main outcome measures: Changes in ACD, VH grading and mean angle width before and after LI.
Results: One hundred fifty eyes (150 subjects) underwent LI in one randomly selected eye. The mean age was 63.14 ± 5.53 years (50-84 years). Majority of the subjects were Chinese (88%) and females (76%). There was no significant difference between baseline data for ACD (paired t test, p= 0.272), VH grading (mcnemar test, p= 0.755) and mean angle width (paired t test, p= 0.756) between eyes that underwent LI and fellow eyes. The VH grading increased significantly after LI (p<0.001). The mean ACD changed from 2.69 ± 0.42 mm to 2.81 ± 0.53 mm after LI (p=0.051). The mean angle grading increased significantly from 0.59 ± 0.54 to 1.83 ± 0.89 (p<0.0001) after LI. There was no significant change at week1 in VH (p=0.15), acd (p=0.83) or angle width (p=0.06) in fellow eyes that did not undergo LI.
Conclusions: In this short-term follow-up of a cohort of asian PACS eyes, sequential lpi widened the angle significantly and there was an increase in peripheral chamber depth. A larger sample size is required to determine the risk factors for progression to angle closure and glaucoma and to assess the benefit of prophylactic LI.
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9.3.10. Clinical forms of glaucomas; Primary angle closure glaucomas: Other

P259 PROGRESSION OF PRIMARY ANGLE CLOSURE SUSPECTS (PACS) AFTER ND:YAG LASER PERIPHERAL IRIDOTOMY - TWO YEAR PROSPECTIVE FOLLOW UP WITH ULTRASOUND BIOMICROSCOPY AND A - SCAN BIOMETRY

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Objective: To analyse baseline and 2-year follow up clinical and biometric data of Primary Angle Closure Suspects (PACS) who underwent Nd:YAG Laser Peripheral Iridotomy (LPI) and to assess the predictive risk factors for progression.
Design: Prospective non-randomised case interventional study.
Participants: PACS subjects from glaucoma services of a tertiary care institution.
Methods and Intervention: Complete ocular examination including indentation gonioscopy, LOCS II grading, A-scan biometry and Ultrasound biomicroscopy were performed at baseline, 1 week after LPI, 6 months, first and second year for PACS subjects (n=52). Subjects underwent Nd:YAG laser iridotomy in both eyes after baseline examination.
Main outcome measures: Progression of PACS to PAC, progression of cataract (>1 LOCS 2 grade), and ocular biometric parameters (Anterior chamber depth (ACD), Anterior Chamber Angle (ACA), Axial Length (AXL), Lens Thickness (LT), Relative Lens Position (RLP), Central Corneal Thickness (CCT), Angle Opening Distance 500 (AOD500), Trabecular'Ciliary Process Distance (TCPD), Iris-Ciliary Process Distance (ICPD), Iris Thickness (IT) and Scleral Ciliary Process Angle (SCPA)) were assessed for one randomly selected eye using logistic regression analysis. Risk factors for the progression of cataract and PACS were analysed. $p < 0.05$ was considered significant.
Results: Eleven (11) out of 52 eyes (21.15%) developed PAC with synechial changes with normal IOP. Additional three (3) eyes developed synechiae adjacent to the PI site. Univariate analysis showed that the Risk Ratio for TCPD < 1 mm was significant for progression (Risk ratio, 1.18; 95% CI, 0.94 to1.49). No association was found for age, gender, ACA, ACD, AOD, ICPD, IT and Vertical Cup Disc Ratio. 40% of the post LPI subjects were found to have progression of cataract at first year and additional 13% progressed by second year follow up. Nuclear sclerosis was more than Posterior Subcapsular variety. ICPD, ACA, LT and AOD500 varied significantly ($p<0.05$) after LPI.
Conclusion: Almost 21% PACS progressed to PAC after LPI but none progressed to PACG in two years. TCPD < 1 mm predicted progression of PACS to PAC. There was significant progression of cataract especially nuclear sclerosis from first year of LPI.

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9.4. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders

P260 A COMPARATIVE STUDY OF DIURNAL PATTERN OF BLOOD PRESSURE AND INTRAOCULAR PRESSURE IN GLAUCOMA PATIENTS

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Purpose: Assuming that human circadian rhythms affect both diurnal intraocular pressure (IOP), and blood pressure (BP) curves similarly, we aimed at finding a relation between both, in normal population and glaucomatous patients, to evaluate the vascular theory of glaucoma.
Methods: Diurnal IOP and BP curves of 869 primary open angle glaucoma (POAG), 157 normal tension glaucoma (NTG) patients and 49 normal controls were retrospectively studied. Four readings including maximum and minimum diurnal IOP and BP mean readings were taken and statistically analysed.
Results: The results showed a definite correlation between diurnal IOP and BP giving mean peaks in the morning hours and troughs in the afternoon. There was a significant difference between the mean peak and trough values of both IOP and BP within each group ($p<0.001$). This magnitude of change was also significantly different between groups for IOP only ($p<0.001$).
Conclusion: With the known nocturnal drop of BP, with stable IOP, the rise of IOP in the early morning shown in the results favors the vascular theory of pathogenesis of glaucoma specially with normal tension assuming low perfusion pressure of the optic nerve head more than the nerve can tolerate.
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blood flow in normal and glaucomatous eyes. Surv Ophthalmol 1994; 38: s198-205. 5. Hayreh SS, Zimmerman MB, Podhajsky P, Alward WL. Nocturnal arterial hypotension and its role in optic nerve head and ocular ischemic disorders. Am J Ophthalmol 1994; 117: 603-624. 6. Racz P, Ruzsonyi MR, Nagy ZT, Gaygi Z, Bito LZ. Around the clock intraocular pressure reduction with once daily application of latanoprst by itself or in combination with timolol. Arch Ophthalmol 1996; 114: 268-273.

P261 CLINICAL PROFILE OF SECONDARY GLAUCOMAS IN A TERTIARY GLAUCOMA CENTRE

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Purpose: To study the clinical profile of secondary glaucomas with the aim of finding possible risk factors for preventive programs.
Design: Retrospective chart review.
Participants: 3000 patients newly diagnosed with glaucoma at our glaucoma clinic in the year 2005 were included.
Methods: Evaluation of all cases who presented with glaucoma was done retrospectively which included detailed history and detailed examination to find all cases of secondary glaucoma and their presenting features.
Main outcome measures: Etiology, age and sex distribution, visual acuity, intraocular pressure, gonioscopy, glaucomatous optic neuropathy and any other positive findings.
Results: Out of 3000 patients, 585 patients (19.5%) had secondary glaucoma. Age distribution was as follows: 25% were between 0-20 yrs; 27% in 21-40 yrs; 30% in 41-60 yrs and 18% were >60 yrs of age. Males predominated with male female ratio of 2.2. Frequent causes of secondary glaucoma were post vitrectomy/buckling procedure (14%), trauma (13%), corneo-iridic scar (12%), aphakia (11%), neovascular glaucoma (10%). Of all traumatic glaucoma patients, 71% cases were <30 yrs of age, and males (90%) predominated in the sex distribution. Blunt trauma was responsible for 84% of the cases. Fifty percent of the cases had baseline IOP of >30 mmHg and 50% had vision ≤6/60. Angle recession of ≥2 quadrant was seen in 59% cases. Post vitrectomy glaucoma eyes had vitreous substitutes in 83% cases of which 66% eyes had retained silicone oil (1,000 centistoke viscosity) for >3 months. Vision ≤6/60 was present in 63% eyes, 57% eyes had baseline IOP >30 mmHg in post-vitrectomy glaucoma. Characteristics of different important secondary glaucomas is given in table 1.
Conclusions: Most patients with secondary glaucoma have poor vision (≤6/60) with high IOP and advanced fundus changes at presentation. A high index of suspicion in such cases can decrease ocular morbidity from this entity.
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9.4.1. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Steroid-induced glaucoma

P262 STEROID RESPONSE AFTER STRABISMUS SURGERY IN CHILDREN

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Purpose: To study IOP level in children, operated on account of strabismus, used corticosteroids in postoperative period.
Methods: Sixty-four children (66 eyes) in the age from 4 to 14 yrs, operated on account of strabismus have been under investigation. All patients underwent full eye examination, including visual acuity, refractometry, tonometry, gonioscopy, ophthalmoscopy, biomicroscopy. None of our patients have had any systemic disease, or other eye disease. Patients, who have had glaucoma in family anamnesis, or who have been treated with corticosteroids previously were not included into investigation. All patients were divided into 2 groups. The first one 39 patients (41 eyes), which were treated by 0,1% dexamethasone (maxidex) in descending scheme. The second group 25 patients (25 eyes), which were treated by flucon in descending scheme. IOP control was performed on the 7th, 14th, 21st, 28th days.
Results: At baseline, the mean IOP were 14,1 ± 2,1 mmHg in the 1st group, 14,9 ± 2,5 mmHg in the 2d. High response (according to armaly classification (1963)) was found out in 9,8% eyes in the 1st group, and 4% eyes in the 2nd group. Middle response was observed in 26,8% eyes in the 1st group and 16% eyes in the 2nd group. All patients except one haven not had complaints. In the cases of high response we canceled steroids, prescribed Xalatan. After 1-3 days IOP was normalized. We didn't observe any case of OH and any case of side effect in the following period of observation.
Conclusions: In the case of corticosteroid prescription in post op period all children needs IOP monitoring. Increasing frequency of 0,1% dexamethasone installation leads to the severe IOP peaks, which appears already on the 4-7th day. High steroid response in children exceeded the similar figures in the adult population (5%). Flucon application in pediatric practice helps to reduce OH risk in post operative period. Xalatan is effective in OH treatment in pediatric practice.
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P263 A LONG-TERM EVALUATION OF THE OPTIC NERVE HEAD IN STEROID INDUCED GLAUCOMA USING HEIDELBERG RETINA TOMOGRAPH II

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Purpose: To evaluate the changes in optic nerve head after cessation of steroid use and control of intraocular pressure in steroid induced glaucoma using Heidelberg Retina Tomograph ii.
Methods: Fifteen patients having steroid induced glaucoma were prospectively evaluated for changes in optic nerve head using HRT II. The parameters were repeated after control of intraocular pressure at 1 year and 2 years.
Results: The average disc size was 2.786 ± 0.468 mm^2. The mean rim area and volume were 1.279 ± 0.567 mm^2 and 0.255 ± 0.175 mm^3 respectively. The mean cup shape measure, height variation contour and mean RNLF thickness were 0.0703 ± 0.125, 0.323 ± 0.110 mm and 0.137 ± 0.082 mm respectively. The baseline average vertical cup-disc ratio was 0.699 ± 0.204. At 2 years, the rim area and volume increased to 1.450 ± 0.660 mm^2 and 0.344 ± 0.266 mm^3 respectively and was statistically significant.
Conclusions: After cessation of steroid therapy and control of intraocular pressure there was reversal of optic disc cupping in patients with steroid induced glaucoma.
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P264 INTRAOCULAR PRESSURE ELEVATION AFTER THE INJECTION OF TRIAMCINOLONE ACETONIDE: TRIAMCINOLONE ACETONIDE STUDY GROUP.

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Purpose: To investigate frequency for the intraocular pressure (IOP) elevation after sub-Tenon capsule injection (STI) and intravitreal injection (IVI) of triamcinolone acetonide (TA).
Design: Multicenter, retrospective, interventional comparison.
Participants: Four hundred one eyes of 401 patients receiving STI (12 mg, 20 mg or 40 mg), IVI (4 mg or 8 mg) or STI (20 mg) plus IVI (8 mg) of TA at 6 clinical centers.
Methods: Frequency and amount of IOP elevation were compared among these TA-treated groups.
Main outcome measures: IOP levels were evaluated before and at 1, 3, 6, 9 and 12 months after TA treatment.
Results: IOP levels of 24 mmHg or higher were observed in 14.3% of eyes treated with 40 mg STI while the IOP elevation was observed in only 2.8% and 3.9% of eyes with 12 mg and 20 mg STIs, respectively, demonstrating significantly higher frequency for IOP elevation in 40 mg STI ($p < 0.01$). Four mg and 8 mg IVIs induced the elevated IOP levels in the frequency of 5.6% and 35.9%, respectively, which also showed statistically significant difference ($p < 0.05$). The simultaneous treatment of STI (20 mg) and IVI (4 mg) induced the IOP elevation in 29.7%, indicating higher frequency than IOP elevation in 20 mg STI ($p < 0.001$) or 4 mg IVI ($p < 0.05$). Additional TA administration (n=95) after the first administration induced 24 mmHg or higher levels in 0% of 12 mg STI, 2.8% of 20 mg STI, 20.9% of 40 mg STI, 100% of 20 mg STI plus 4 mg IVI, showing significant high frequency in 40 mg STI ($p < 0.05$) and 20 mg STI plus 4 mg IVI ($p < 0.001$). Multiple regression analysis demonstrated that higher IOP elevation at the first injection was also a risk factor for abnormal high IOP levels at the second injection ($p < 0.05$).
Conclusion: The IOP elevation after the injection of TA shows dose-dependency.
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P265 OCULAR HYPERTENSION FOLLOWING INTRAVITREAL INJECTION OF TRIAMCINOLONE ACETONIDE FOR THE TREATMENT OF CHOROIDAL NEOVASCULAR MEMBRANES

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Purpose: To determine incidence of ocular hypertension (OHT) as a result of intravitreal injection of triamcinolone

acetonide (IVTA) for the treatment of choroidal neovascular membranes (CNVM) and to evaluate risk factors involved.
Design: Interventional consecutive case series.
Participants: Thirty patients (45 eyes) who underwent IVTA injection combined with photodynamic therapy (PDT) in a private practice setting for the treatment of CNVM.
Methods: Forty-five eyes of 30 patients who received a single IVTA injection (4 mg/0.1 ml) performed by the same surgeon were evaluated. Intraocular pressure (IOP) was monitored with Goldmann tonometry the first day after IVTA injection, at one week, one month and then every month during the first year.
Main outcome measures: Intraocular pressure elevation.
Results: A total of 45 IVTA injections were performed combined with PDT. Demographics revealed mean age of 75 ± 7.3 years and 75% females. No positive personal or family history of glaucoma was found. Mean follow up was 9.6 ± 3.5 months. Mean IOP before IVTA injection was 15 ± 3.0 mmHg and mean post IVTA injection IOP was 17.6 ± 4.4 mmHg. OHT ≥ 24 mmHg was developed in 17.7% (8 eyes). Mean time to IOP elevation was 4 months after IVTA injection. The IOP elevation was transient in 6 eyes and responded adequately to medical therapy. Two eyes required chronic use of medications for IOP control. None of the eyes developed optic nerve damage.
Conclusions: IVTA injection for CNVM is frequently used and it is mandatory to be aware of the potential IOP elevation that may follow. Special attention must be paid to patients with family and/or personal glaucoma history. IOP elevation tends to be transient and to respond to medical treatment. IOP elevation may occur later after the IVTA injection, it is advisable to follow up patients closer during the first year.
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9.4.2.1. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with disorders of the of the cornea, conjunctiva, sclera: Iridocorneal endothelial syndrome

P266 IRIDOCORNEAL ENDOTHELIAL(ICE) SYNDROME WITH GLAUCOMA IN A YOUNG GIRL WITH DOWN'S SYNDROME

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Purpose: To describe the occurrence of iridocorneal endothelial (ICE) syndrome with glaucoma in a young girl with Down's syndrome.
Design: Case study.
Methods: A 16-year old girl with downs syndrome and visual acuity of 6\18 in re and 6\6 in LE was found to have secondary glaucoma with features of progressive iris atrophy in her RE. On specular microscopy there was varying degree of pleomorphism, lack of clear hexagonal pattern with some cells showing dark centers (disseminated ICE cells) in the RE. The specular count in the RE was 2044/mm^2 compared to 3400/mm^2 in the LE.
Results: The patient underwent an uneventful trabeculectomy with mitomycin. Her IOP was controlled without medication to 12 mmHg, 9 months post operatively. Electron microscopy of the trabecular meshwork obtained in this case is described.
Conclusion: The presence of ICE syndrome in a patient with downs has previously never been reported. The relatively younger age of the girl along with the presence of downs syndrome points toward a genetic association to ICE syndrome.
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9.4.2.5. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with disorders of the cornea, conjunctiva, sclera: Other

P267 ASSESSMENT OF THE ANTERIOR SEGMENT IN OPAQUE GRAFTS WITH SECONDARY GLAUCOMA FOLLOWING THERAPEUTIC PENETRATING KERATOPLASTY FOR PERFORATED CORNEAL ULCERS

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Objective: To evaluate the clinical and ultrasound biomicroscopic characteristics of opaque tectonic grafts with secondary glaucoma.
Design: Observational cross sectional study.
Participants: Thirty-six eyes of 36 patients with opaque grafts (precluding anterior segment by slit lamp biomicroscopy) and elevated IOPS (> 25 mmHg) following therapeutic corneal grafting for a perforated corneal ulcer.
Methods: All patients underwent detailed clinical evaluation including slit lamp biomicroscopy, IOP assessment using tonopen and ultrasound biomicroscopy (UBM) of the anterior segment and anterior chamber angle in each clock hour using paradigm p40-machine.
Main outcome measures: Central corneal thickness, anterior chamber angle, degree of synechial closure, type of synechiae, status of the lens/IOL.
Results: The mean age of the patients was 48.5 years (range 12-75 years). The mean IOP at the time of presentation was 34.2 mmHg (range 26-50 mmHg). The mean time of presentation after keratoplasty was 7.6 months (range 3-24 months). 28 out of 36 (80%) therapeutic keratoplasty procedures were accompanied by cataract extraction and anterior vitrectomy. LOL implantation was carried out in 9 cases (25%). ACIOL implantation was carried out in 8 cases and PCIOL implantation in 1 case. No case underwent intra operative iridoplasty. The mean CCT was was 864.67 µm (range 637-1400 µm). UBM revealed 900 peripheral anterior synechial closure in 4 eyes (11.11%), 90-1800 in 6 eyes (16.67%), 180-2700 in 15 eyes (41.67%), and 3600 synechial closure in 11 eyes (30.55%). Synechiae at the graft host junction were present in 8 eyes (22.22%), and 2 eyes had central irido-corneal synechiae (5.55%). LOL corneal touch was present in one case (2.78%).
Conclusions: Secondary angle closure is the major cause for glaucoma following therapeutic keratoplasty. UBM plays an important role in the anterior segment evaluation of such eyes and aids in planning future surgical intervention.

9.4.3.1. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with disorders of the iris and ciliary body: Pigmentary glaucoma

P268 CLINICAL SIGNS AND CHARACTERISTICS OF PIGMENTARY GLAUCOMA IN CHINESE: A PROSPECTIVE STUDY

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Purpose: Studies have shown that the clinical signs and prevalence of pigmentary glaucoma (PG) vary across racial groups. The literature so far contains few reports of PG in Asians. The purpose of this article is to report clinical findings in 12 Chinese patients with PG.
Design: Prospective, observational, consecutive, clinical case series.
Participants: Patients with moderate to heavy trabecular meshwork (TM) pigmentation as well as corneal endothelial pigmentation or zonular/lenticular pigment granule dusting, and two or more of the following signs: intraocular pressure (IOP) greater than 21 mmHg, glaucomatous optic nerve damage, or visual field loss.
Methods: The recruited patients received thorough ocular examinations including visual acuity, refraction, biomicroscopy, IOP measurement, fundus examination, and ultrasound biomicroscopy and Humphrey sita-standard 30-2 visual field analysis.
Main outcome measures: Age, gender, uncorrected visual acuity, best corrected visual acuity, spherical equivalent diopters, IOP at initial diagnosis, corneal endothelial pigmentation, anterior iris stromal pigment dusting, iris configuration, TM pigmentation, lenticular/zonular pigment granule dusting, iris transillumination defects (TIDS), vertical cup/disk ratio, and visual field analysis.
Results: Twelve subjects (9 males and 3 females) were enrolled in this study. Mean age of the subjects at initial diagnosis was 36±6 years (range, 26 to 48), as shown in figure 1. All eyes diagnosed with PG were myopic, with mean spherical equivalent power of6.67±5.92 d (range,23.75 to0.25 d). The distribution of refractive error of all subjects was shown in figure 2. The average IOP at initial diagnosis was 35.9±9.5 mmHg (range, 16 to 56). Ten patients (83.3%) had corneal endothelial pigmentation. Eight of them had Krukenberg spindle in at least one eye. The other two exhibited trace corneal endothelial pigmentation (<50 flecks) in diffusive pattern. All subjects showed different extent of posterior iris bowing (figure 3). No subject exhibited any typical mid-peripheral radial TIDS. Trace TIDS were visualized in iris crypts in both eyes of two subjects, both of whom had severe myopic refractive error of >20.0 diopters (figure 4). Three patients (3 of 12) had iridodonesis. Anterior iris stromal pigment dusting was discerned in one subject.
Conclusions: Besides corneal endothelial pigmentation, TM pigmentation, and lenticular/zonular pigment granule dusting, iris concavity was consistently present in Chinese PG patients, while typical mid-peripheral TIDS and anterior iris stromal pigment dusting were not common in these patients.

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9.4.4. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with disorders of the lens

P269 A CLINICAL STUDY OF SPHEROPHAKIA

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Background: Microspherophakia is a condition where the equatorial diameter and weight of the lens is reduced by 25% while the saggital diameter is increased by the same amount.
Methods: Retrospective non comparative analysis of 58 eyes of 29 consecutive patients of spherophakia presenting to the L.V. Prasad Eye Institute.
Results: Incidence of lenticular dislocation in term of eye years was 8.31%. Glaucoma was seen in 28 eyes (60.9%) of which open angle glaucoma was seen in 11 eyes (39.3%) and angle closure glaucoma in 15 eyes (53.6%).
Conclusions: Medical management of glaucoma in spherophakia in our series of patients was a safer alternative to surgical intervention. The combination of anti-glaucoma medications and Nd:Yag PI, where indicated, controlled the intraocular pressure satisfactorily in a majority of the patients. When surgical intervention was required for glaucoma it was associated with a significant risk of complications.
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P270 ALPORTS SYNDROME WITH RAISED INTRAOCULAR PRESSURE

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Introduction: Alports syndrome is associated with metabolic defect in biosynthesis of collagen in glomerular basement membrane, cochlea and capsule of the lens. Inheritance is x linked in most of the cases.
Manifestations: 1. Ocular-anterior lenticonus, dot fleck retinopathy, posterior polymorphous dystrophy; 2. Renalhematuria, proteinuria; 3. Hearing loss.
Mortality: It is a progressive disease that ultimately leads to renal failure and death.
Participants: Male patient, 36 years old.
Chief complaints: Decreased vision.
Family history: Two brothers have died of renal failure.
On examination: Anterior segment-shallow anterior chamber, and anterior lenticonus in both eyes. IOP 40 mmHg (RE); 28 mmHg (LE). Gonioscopyboth eyes angles were closed. Fundus was within normal limits.
Systemic investigation: Blood pressure-160/100. Urinehematuria. Albuminuria. Hyline casts and Ca oxalate crystals. Usg abdomen within normal limits.
Audiometery: Detected bilateral severe sensory neural deafness. Serum creatinine within normal limits.
Management: Surgery temporal clear corneal with in bag IOL implantation in right eye. Post operative IOP at one month followup was 16 mmHg.
Conclusion: The weak basement membrane in alports syndrome causes forward bulging of the anterior lens capsule causing angle closure and raised IOP. The removal of lens with in bag IOL lowers IOP.
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9.4.4.1. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with disorders of the lens: Exfoliation syndrome

P271 PSEUDOEXFOLIATION SYNDROME IN GLAUCOMA PATIENTS AND AGE-MATCHED GENERAL POPULATION IN MOLDOVA

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Purpose: To estimate prevalence of pseudoexfoliation syndrome in glaucoma and non-glaucoma patients in moldova. To evaluate associations of PEX with age, gender and glaucoma diagnosis.
Design: Prospective, comparative cohort-based study.
Participants: Seven hundred nineteen non-glaucoma per-

sons and 373 glaucoma patients seen in the Tiraspol Glaucoma Clinic in 2004-2005. Participants were selected on the basis of study inclusion criteria which were determined as age older 50, satisfactory corneal transparency, no history of cataract surgery and established diagnosis of glaucoma for glaucoma subgroup.
Methods: Thorough bilateral non-dilated slit-lamp search for pseudoexfoliation material on corneal endothelium, aqueos humor, iris and anterior surface of lens.
Main outcome measures: Prevalence of PEX in glaucoma patients and those without glaucoma.
Results: Pseudoexfoliation was found in 236 out of 373 glaucoma patients and 123 out of 719 non-glaucoma. Prevalence rate consisted 63.3% and 17.1% ($p<0.0001$). Also, the mean age of PEX patients in the glaucoma group was higher than in the non-glaucoma group (70.4 vs 69.4), but not significantly (p-0.25). The mean age of PEX patients in the non-glaucoma group was significantly higher than non-PEX (72.3 vs 61.2, $p<0.0001$). No significant differences in gender representations between PEX and non-PEX patients were found in both glaucoma (p- 0.73) and non-glaucoma (p-0.52) groups.
Conclusions: Pseudoexfoliation syndrome has a very high rate in both glaucoma and non-glaucoma patients in Moldova. PEX was found to be four times more common in glaucoma compared to age-matched non-glaucoma individuals. Prevalence of PEX is not associated with gender, but tends to increase with age in both glaucoma and non-glaucoma patients.
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P272 PSEUDOEXFOLIATION AND DIABETES MELLITUS

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Purpose: To detect the frequency of pseudoexfoliation (PEX) in diabetes mellitus (DM).
Design: Case-control study.
Participants and controls: This study consisted of 202 patients with or without diabetic retinopathy (DR) and 119 healthy subjects.
Methods: On ophthalmological examination, the anterior and posterior segments of all the cases were evaluated and intraocular pressures (IOP) were measured with Goldmann applanation tonometry.
Main outcome measures: To assess the prevalence of pseudoexfoliation in diabetic patients.
Results: There was no statistically significant difference in patient and control group for the age and gender ($p>0.05$). PEX syndrome was present in 11.9% of DM patients (n:24) and 17.6% of control subjects(n:21). PEX glaucoma was detected in 3.5% of DM patients (n:7) and 4.2 % of controls (n:5). The difference between patients with DR and patients without DR with regard to the frequency of PEX was not statistically significant ($p>0.05$).
Conclusion: These results indicate that the frequency of PEX is similar between DM and healthy subjects.
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P273 DIURNAL VARIATION OF INTRAOCULAR PRESSURE IN PSEUDOEXFOLIATION

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Objective: To determine if measurement of diurnal variation of intraocular tension (DVT) is of use in diagnosing glaucoma associated with pseudoexfoliation syndrome (PEX).
Design: Prospective cohort study. All patients presenting with evidence of PEX on complete eye examination in OPD were approached for recruitment.
Participants: One hundred out of 140 patients agreed to participate.
Methods of testing: Two hourly DVT between 8 am and 3:30 pm was recorded by a single observer. Gonioscopy, presenting intraocular pressure (IOP), visual fields (HFA 30-2) and disc examination were recorded. This was repeated 6 weeks after cataract surgery in those who had presented with cataracts.
Main outcome measures: Glaucoma was diagnosed on IOP alone (secondary glaucoma, IOP > 21mmHg), with disc appearance and field changes as corroborating features. IOP readings averaged or singly were used in analysis.
Results: Thirteen eyes had PEX glaucoma. Two of these had disc changes and IOP > 30 mmHg and underwent combined cataract and glaucoma surgery. Two were controlled medically and underwent cataract surgery. The rest had no disc or field changes, IOP < 25 mmHg and are under follow up with no treatment. Presenting IOP and average DVT IOPs are compared in figure 1. Those eyes with IOP values > 21mmHg or DVT > 6mmHg had already been classified as glaucoma on initial presenting IOP. Thus DVT had no additional value over presenting IOP in diagnosing glaucoma in the study group. The ROC curve in figure 2 illustrates this. Paired t testing on the same data showed no significance ($p=0.34$). Seventy-seven eyes underwent cataract surgery of which only 31 returned for a 6 week postoperative DVT. A paired t test revealed no significant change. Forty-eight patients had unilateral PEX. A two sample test of proportion showed insignificant IOP difference between the normal and PEX eye ($p=0.37$). Three patients

had >3 mmHg difference between the eyes. Owing to advanced cataract and poor performance, most visual field tests were unreliable and dropped from analysis.
Conclusions: DVT offered no additional benefit over presenting IOP in diagnosing glaucoma in eyes with PEX. Unilateral PEX was not associated with significantly raised IOP in that eye.
Cataract surgery did not change the DVT significantly at 6 weeks postoperatively.
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P274 IMPAIRED PROTEASOME FUNCTION IN THE PATHOGENESIS OF PSEUDOEXFOLIATION SYNDROME
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Purpose: Increased accumulation and aggregation of oxidatively modified proteins, partly resulting from a dysfunction of the ubiquitin-proteasome pathway, have been described as a hallmark of various age-related degenerative disorders. The objective of this study was to investigate proteasome function and protein oxidation in pseudoexfoliation (PEX) syndrome, which is characterized by a progressive accumulation of abnormally aggregated extracellular fibrils and increased oxidative stress.
Methods: Twelve eyes with PEX syndrome without and with glaucoma and 12 age-matched control eyes without PEX, either obtained at autopsy (post mortem time < 8 hours) or at surgical enucleation, were used. Proteasome activity was measured in ciliary body extracts by using fluorogenic peptides as substrates for the three different protease activities of the 26s proteasome; a proteasome activity inhibitor (epoxomicin) was used as control. Total proteasome content was determined by western blot analysis using antibodies against specific proteasomal subunits. The expression of ubiquitin-conjugating enzymes, which are members of the ubiquitin-proteasome system, was analyzed in anterior segment tissues by real-time PCR and immunohistochemistry. Immunohistochemical analysis of oxidative protein modifications in PEX tissues was performed using antibodies against dinitrophenol (DNP).
Results: Both the chymotrypsin-like and trypsin-like proteasome activities were significantly reduced (up to 55%; $p<0.001$) in ciliary body extracts from PEX eyes compared with control eyes, whereas the caspase-like activity was unchanged. This reduction in proteasome activity was independent of the presence of glaucoma in PEX eyes and was not associated with a decrease in proteasome expression. In contrast to the ubiquitin-conjugating enzymes ube2d1, ube2d2 and ube2d3, the expression of the ubiquitin carrier enzymes ube2a and ube2b was significantly reduced both on the MRNA (about 60%; $p<0.001$) and protein level in ciliary body and iris specimens of PEX eyes compared with control eyes. An accumulation of oxidatively modified proteins was observed within PEX material deposits in anterior segment tissues of PEX eyes.
Conclusions: These findings suggest that compromise of the proteasome system may be involved in the pathophysiology of PEX syndrome and may contribute to the accumulation of oxidatively modified proteins within the abnormal extracellular matrix deposits

P275 INCREASED LEVELS OF INTERLEUKIN-6 IN THE AQUEOUS HUMOR OF PATIENTS WITH EARLY STAGES OF PSEUDOEXFOLIATION SYNDROME/ GLAUCOMA
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Purpose: Subtle inflammatory conditions have been implicated in initial stages of various systemic fibrotic disorders. To determine the role of inflammatory processes in the pathophysiology of pseudoexfoliation (PEX) syndrome/ glaucoma, we examined the presence and expression of (pro-) inflammatory cytokines in eyes from PEX and control patients.
Methods: Patients were classified as early or late stage PEX syndrome according to slitlamp findings of PEX material deposits on lens and pupillary margin. Aqueous humor samples from patients with cataract, primary open-angle glaucoma (POAG), early and late stages of PEX syndrome with and without glaucoma (n=14 for each patient group) were analyzed for twenty different cytokines by multiplex-bead immunoassay. In addition, aqueous IL-6 concentrations were measured by ELISA (n=12 for each group), and MRNA expression of IL-6 in the ciliary body was quantified by real-time PCR (n=4 for each group).
Results: Multiplex-bead immunoassay revealed a statistically signifcant increase of aqueous IL-6 levels in patients with early stages of PEX syndrome ($p<0.002$). Differences in aqueous IL-6 levels were confirmed by ELISA and displayed a specific increase in early stages of PEX syndrome with (1.9-fold; $p<0.001$) and without glaucoma (2.3-fold; $p<0.002$) as compared to cataract, POAG, and late stages of PEX syndrome with and without glaucoma. Quantitative real-time PCR displayed a statistically significant increase of IL-6 MRNA in the ciliary processes of early stages of PEX syndrome/ glaucoma (2-fold; $p<0.003$) compared with all other groups of patients.
Conclusions: In view of the involvement of inflammatory cytokines in early stages of fibrotic disorders, such as lung fibrosis, these findings suggest that low-grade subclinical inflammatory processes, reflected by increased levels of IL-6, may play a pathophysiological role in initial stages of the abnormal matrix metabolism characteristic of PEX syndrome.

9.4.4.2. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with disorders of the lens: Glaucomas associated with cataracts

P276 SUTURELESS COMBINED TRIPLE PROCEDURE IN PHACOLYTIC GLAUCOMA

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Purpose: To demonstrate the effectiveness of triple combined sutureless surgery.
Design: A patient of phacolytic glaucoma underwent triple procedure for minimal cost to the institution.
Participant: A 60-year old lady with phacolytic glaucoma.
Methods: A 60 year old lady presented with phacolytic glaucoma of 2 weeks duration in the right eye. The AC was full of milky fluid. The surgery undertaken was triple surgery (SICS with PC-IOL with sutureless trabeculectomy). A frown-shaped incision was given superiorly, 6- 7 mm long,1.5 mm away from the cornea. A corneoscleral tunnel was made,anterior chamber was entered with a 3 mm keratome. Anterior capsule was stained with trypan blue, CCC was done. Nucleus was prolapsed in the AC, delivered with an irrigating wire-vectis. Irrigation-aspiration of the cortical matter was completed, through a constricted pupil. A rigid PC-IOL was implanted. Trabeculectomy was done with a kellys descemets membrane punch. Air was injected in the AC, wet-field cautery was used to replace the conjunctival flap
Results: Post-operatively, IOP was controlled, a vision of 6/18 was achieved in a patient who could not afford any treatment.
Conclusions: Sutureless combined procedure is safe,effective and apparently successful in phacolytic glaucoma, especially since the total cost of the surgery was less than 10 US dollars, borne by the institution

9.4.5. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with disorders of the retina, choroid and vitreous

P277 EVALUATION OF GLAUCOMATOUS DAMAGE IN THE FELLOW EYES OF PATIENTS WITH UNILATERAL RETINAL VEIN OCCLUSION

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Purpose: To investigate the visual field (VF) and retinal nerve fiber layer (RNLF) status of the fellow eyes in patients with unilateral retinal vein occlusion (RVO).
Design: Cross-sectional study.
Participants: Fifty-seven patients with unilateral RVO and 43 normal control subjects were consecutively recruited. Of the 57 RVO patients, 32 subjects had branch retinal vein occlusion (BRVO), and 25 subjects had central retinal vein occlusion (CRVO).
Methods: Each patient had a Humphrey visual field (HVF) examination and scanning laser polarimetric (SLP) evaluation of RNLF using GDX-VCC. VF and RNLF status were compared between the fellow eyes of the patients with unilateral RVO and control eyes. We also assessed the risk factors for the development of glaucomatous damage in the fellow eyes of unilateral RVO patients.
Main outcome measures: Visual field indices on HVF and RNLF thickness parameters as measured by GDX-VCC
Results: Seventeen fellow eyes out of 57 patients with unilateral RVO showed glaucomatous VF and RNLF change. All VF (mean deviation, pattern standard deviation) and RNLF thickness parameters (tsnit average, superior average, inferior average, and TSNIT standard deviation (SD)) in the study group were significantly lower than those in the control group ($p<0.05$, independent samples t-test). There was no difference of VF and RNLF parameters between BRVO and CRVO group. Increased age and vertical cup-to-disc ratio were consistently associated with severe VF and RNLF damage in the fellow eye of unilateral RVO patients. Neither intraocular pressure nor the period after the onset of RVO was associated with it.
Conclusions: The fellow eyes in patients with unilateral RVO showed significantly worse VF indices and lower RNLF thickness than normal control eyes. The glaucomatous change should be carefully monitored in the fellow eyes of unilateral RVO patients.
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9.4.5.1. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with disorders of the retina, choroid and vitreous: Neovascular glaucoma

P278 INTRAVITREAL BEVACIZUMAB IN THE TREATMENT OF SYMPTOMATIC NEOVASCULAR GLAUCOMA

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Purpose: To study the short term efficacy of intravitreal bevacizumab in a series of patients with neovascular glaucoma.

Design: Prospective non-randomized case series.
Participants: Eight patients with neovascular glaucoma and symptomatic elevation of intraocular pressure. Neovascular glaucoma was caused by central retinal vein occlusion in 6 patients, and by proliferative diabetic retinopathy in two patients. Preoperative visual acuity ranged from hand motion (HM) to 0,075.
Intervention: Intravitreal injection of 1.25 mg/0,1 ml bevacizumab was performed in all patients. Additional cyclocryopexy was performed only if intraocular pressure was not controlled with topical medication. All patients were followed-up for a minimum of 8 weeks.
Main outcome measures: Postoperative intraocular pressure.
Results: Intravitreal application of bevacizumab resulted in a marked regression of iris neovascularization in all patients in the first three postoperative days. Postoperative visual acuity ranged from HM to 0,1. All patients experienced a marked increase in comfort and cessation of pain. Intraocular pressure was sufficiently controlled in five patients. Three patients required additional cyclocryopexy. We noted no side effects from intravitreal bevacizumab.
Conclusions: Intravitreal bevacizumab seems to be a potent adjunct in the management of neovascular glaucoma. Further studies into the optimal timing and dosage of bevacizumab in the treatment of neovascular glaucoma are warranted.
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9.4.6. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with inflammation, uveitis

P279 THE ASSOCIATION BETWEEN POSNER-SCHLOSSMAN SYNDROME AND HELICOBACTOR PYLORI INFECTION

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Purpose: This study was conducted to investigate a possible association between Helicobacter pylori infection, which may have inflammatory nature, and Posner-Schlossman syndrome.
Design: Prospective, nonrandomized.
Participants and controls:. This study included 21 eyes of 21 patients with Posner-Schlossman syndrome and 50 age-matched normal controls.
Methods: Posner-Schlossman syndrome was diagnosed on the basis of findings in ophthalmic and laboratory examinations. All participants performed serologic test of H. pylori IGG AB to detect H. pylori infection.
Main outcome measures: There is highly association with helicobacter pylori infection and Posner-Schlossman syndrome.
Results: Among 21 patients, there were 16 males (76.2%) and 5 females (23.8%), with a mean age of 49.9±15.9 years. The Posner-Schlossman syndrome showed an H. pylori infection prevalence of approximately 85.7% (H. pylori IGG AB (+): n=18 patients). In H. pylori IGG AB (+) group, glaucoma was 50% (n=9 patients). Recurrent attacks were in 6 patients (in H. pylori IGG AB (+) group, 33%, n=6).
Conclusions: In our study, H. pylori infection was more frequent in Posner-Schlossman syndrome patients. We think, H. pylori may be either a common factor that causes susceptibilities to Posner-Schlossman syndrome or one of causal factors for developing Posner-Schlossman syndrome.
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P280 GLAUCOMA IN UVEITIS-IDENTIFICATION OF FACTORS INFLUENCING OUTCOME

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Purpose: To report the outcome of uveitic glaucoma and identify risk factors influencing its prognosis.
Design: A retrospective case-series.
Participants: Patients with uveitic glaucoma seen at a tertiary care centre between January 2000 to December 2005 with following inclusion criteria were included:(1) evidence of uveitis (active or inactive) with raised intraocular pressure (IOP>21 mmHg) for at least 2 months, with or without glaucomatous disc damage; (2) initial evidence of glaucomatous disc damage in a known case of uveitis;

(3) follow-up of at least 12 months from initiation of antiglaucoma therapy. Patients undergoing cataract or vitreous surgery during the study period were excluded.
Methods: Factors such as anatomic location of uveitis, initial and maximally raised IOP, duration of glaucoma, use of steroids, and width of anterior chamber angle were analysed for their effect on the outcome of antiglaucoma therapy. Surgical intervention included Nd-YAG laser iridotomy, surgical iridectomy, trabeculectomy with mitomycin-c, cyclocryotherapy, or diode laser cyclophotocoagulation.
Main outcome measures: The main outcome measure was success of treatment, defined as IOP of < 22 mmHg with or without maximum antiglaucoma drugs, and > 5mmHg.
Results: Out of 1600 uveitis patients, 87 (5.43%) met the above criteria. The mean age was 36.36 ± 14.33 years (range 13 to 72 years). There were 55 males and 32 females. The mean follow up was 36.00 ± 18.43 months (range 12 to 83 months). 107 eyes (81.06%) had secondary open-angle glaucoma (SOAG-steroid induced or inflammatory), 5 had partial angle-closure with peripheral anterior synechiae, 15 had pupillary block with angle-closure, and 5 had neovascular glaucoma (NVG). Overall, 74.6 % eyes were medically controlled and the remaining 27.3% required surgical therapy. The latter group included 16.8% of secondary open angles, 75% of secondary angle-closure glaucoma (sacg) and 80% of NVG. One hundred and eighteen (90.1%) eyes showed successful control of IOP at final follow-up. 9.3% of soag, 10% of sacg and 40% of NVG (overall, 9.9%) had an unfavourable outcome. One eye became phthisical.
Conclusion: Majority of patients could be controlled with medical treatment. Patients with NVG required more aggressive treatment and had least favourable outcome, followed by those with secondary angle closure. Patients with posterior or panuveitis, or with IOP elevations beyond 50 mmHg were difficult to manage (p< 0.05).
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9.4.7. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with trauma

P281 GLAUCOMA FOLLOWING OCULAR INJURY

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Objective: To study the incidence of glaucoma following ocular injury.
Design: Prospective observational case series.
Participants: All the patients with ocular trauma who attended our hospital between January 2004 to December 2006. Exclusion criteria: Patients with chemical injury, previous history of glaucoma.
Results: A total of 193 patients were included in the study. Of these, 128 patients sustained blunt injury to the eye, rest were due to penetrating injury. Of the patients 86.01% of the patients were males. Thirty-three patients had glaucoma. Of these, 16.4% were following blunt injury and 18.4% were following penetrating injury. Cause of glaucoma was due to inflammation in 9 patients, pupillary block in 7 patients, hyphema in 7 patients. Angle recession glaucoma was seen in 5 patients.
Conclusion: A total of 17.09% of the patients developed glaucoma following trauma. In our study incidence of glaucoma was more in patients with penetrating injury. Males were more commonly involved than females ['p' not significant]. 44.16% of the patients were in the productive age group of 30-49 years. The majority of the patients developed glaucoma in the immediate post trauma period. Hence it is important to monitor the IOP closely in the immediate post trauma period. Inflammation and mechanical obstruction was the mostcommon cause of glaucoma following trauma. Though angle recession was seen in 27.27% of the patients, all of them did not develop glaucoma.

P282 PREDICTORS OF CHRONIC TRAUMATIC GLAUCOMA IN EARLY CLOSED GLOBE INJURY

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Purpose: To analyze clinical and ultrasound biomicroscopic (UBM) features in eyes with closed globe injury, at presentation that would predict the occurrence of traumatic glaucoma over a 6-month follow-up.
Methods: Consecutive patients having a closed globe injury were prospectively reviewed for more than 6 months. 40 consecutive eyes with closed globe injury and a chronically raised IOP > 21mmHg for the duration, were diagnosed as traumatic glaucoma and evaluated clinically and by UBM. These were compared with 52 eyes having closed globe injury, but without glaucoma.
Results: The average grade of pigmentation on gonioscopy in eyes with traumatic glaucoma was 3.3+0.57 compared to only 1.9+0.7 in eyes without glaucoma,(p<0.0001). On UBM 18 eyes showed evidence of cyclodialysis in eyes with closed globe injury without glaucoma, as compared to 7 eyes with glaucoma (p value=0.001). UBM parameters in traumatic glaucoma had significantly wider angles, ara 0.730.4 mm^2 vs 0.5 30.2 mm^2, ssir 0.6 30.4 mm vs 0.430.2 mm and AOD (250) 0.6 30.27 mm vs 0.4630.2 mm respectively (p<0.05).
Conclusion: Clinically the presence of increased pigmentation at the angle, hyphema, cataract, with lens displacement and angle recession >180 ° were significantly associated with the occurrence of a chronic glaucoma following closed globe injury. On UBM, a greater angle recess area and the absence of cyclodialysis were significant predictors to later traumatic glaucoma.
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jury registry. J. Glaucoma 2005;14:470-3. 3. Canavan YM, Archer DB. Anterior segment consequences of blunt ocular injury. Br J Ophthalmol 1982; 66: 549-555. 4. Fillip JA, Barros H, Castro-Correia J. Sports related ocular injuries. A three- year follow-up study. Ophthalmology 1997; 104:313-318. 5. Gentile RC, Pavlin CJ, Liebmann JM, Easterbrook M, Tello C, Foster FS, Ritch R. Diagnosis of traumatic cyclodialysis by ultrasound biomicroscopy. Ophthalmic Surg Lasers 1996;27:97.

P283 SECONDARY POST-TRAUMATIC GLAUCOMA

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Purpose: 1. To show how necessary is a long term following up patients who suffered blunt eye trauma. 2. To point out the influence of patient's non-compliance on glaucomatous disease progress.
Case report: A now 50 years old man suffered blunt eye trauma of his left eye in 1997. Examination by slit lamp showed slight hyphaema, traumatic mydriasis and increase of intraocular pressure (IOP) up to 42 mmHg. Gonioscopy was normal, without any traumatic changes, lens was without subluxation or dislocation. Fundus biomicroscopy was also normal.
He was recommended to use beta-blocker eye drops and educated about the importance of the treatment and regular control. But he was not using glaucoma medication as prescribed and failed to turn up the examination. Seven years later he came with severe eye and periorbital pain and claudy vision of the left eye. The main reason of secondary post-traumatic glaucoma was dislocation of the lens to the vitreous. IOP of both eyes was 14 and 45 mmHg, central corneal thickness was 495 and 508um. Fundoscopy and perimetry detected glaucoma neuropathy ii. Gr. Aulhorn. Not even maximal topical therapy could decrease the IOP. Finally the patient underwent phacoemulsification of dislocated lens with PC-IOL implantation.
Conclusions: 1. Following up patients with ocular blunt trauma complicated by hyphaema or lens dislocation is necessary. Post-traumatic glaucoma can develop several years later. 2. The importance of patient's compliance for successful treatment. 3. The question is the gonioscopy at the first examination in this case.

P284 MEDICAL AND SURGICAL INTRAOCULAR PRESSURE CONTROL AFTER TRAUMATIC EXPULSIVE IRIDODIALYSIS

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Objective: To describe the medical and surgical management of increased intraocular pressure in the setting of a traumatic expulsive iridodialysis with total hyphema.
Design: Case report.
Intervention: Medical management and three anterior chamber washouts.
Main outcome measures: Intraocular pressure (IOP) and hyphema clearing.
Results: A patient with a history of previous uneventful clear-cornea cataract surgery experience blunt trauma with a total expulsive iridodialysis. The iris was likely ejected through the clear-cornea wound and the anterior chamber reformed by the severe intraocular bleeding/total hyphema. No open globe was identified. The patient's recovery was complicated by a total hyphema and intraocular pressures to the 50's (mmHg) despite medical therapy. Multiple anterior chamber washouts over several days were used to control the IOP and avoid a filtering procedure in this already traumatized eye. Insight into the chronology of IOP control in relation to the timing of anterior chamber washouts and anterior chamber clot lysis is revealed in this unusual case. This patient ultimately recovered 20/20 vision with normal iops on no glaucoma treatment.
Conclusion: In the traumatized eye with a severe hyphema and medically uncontrolled iops, serial anterior chamber washouts can be an effective tool for avoiding the need for filtering surgery. Each anterior chamber washout with additional medical treatment provides about 4-5 days of IOP control before subsequent clot lysis necessitates an additional washout.

9.4.9. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas associated with elevated episcleral venous pressure

P285 HISTOPATHOLOGICAL EVALUATION OF TRABECULECTOMY SPECIMENS IN EYES WITH STURGE-WEBER SYNDROME

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Objective: To evaluate the histopathology sections of samples obtained after trabeculectomy in glaucoma associated with Sturge-Weber syndrome.
Design: Institution based cross-sectional study.
Participants: Histopathology specimens of twelve cases of glaucoma secondary to Sturge-Weber syndrome.
Methods: Trabeculectomy samples of twelve eyes operated for glaucoma secondary to Sturge-Weber syndrome were examined histopathologically under light microscopy.
Main outcome measures: To identify histopathological abnormalities in the trabecular meshwork of patients with glaucoma in Sturge-Weber syndrome.
Results: On light microscopic examination of serial sections, few specimens showed trabecular meshwork where we could identify thickened trabecular beams with excess collagenous tissue. No abnormal vessels were identified in the trabecular meshwork in the serial sections that were studied. Additionally, few sections revealed juxtacanalicular connective tissue with increased cellularity along with an eosinophilic membrane seen at the edge of juxtacanalicular tissue.
Conclusions: Developmental anomalies in the form of abnormal juxtacanalicular tissue was the most common identifiable abnormality on light microscopy sections of trabecular meshwork along with thickened trabecular beams.
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9.4.11.2. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas following intraocular surgery: Glaucomas in aphakia and pseudophakia

P286 SECONDARY GLAUCOMA AFTER PAEDIATRIC CATARACT SURGERY

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Purpose: To determine the prevalence and risk factors associated with secondary glaucoma post congenital cataract surgery.
Design: All children diagnosed with congenital cataracts in a major children's hospital between 1985 and 2005 were included in a retrospective case series.
Participants: Medical records of 423 eyes among 283 patients who underwent cataract surgery with or without intraocular lens implantation at age =< 16 for congenital cataract were reviewed.
Main outcome measures: Presence or absence of secondary glaucoma and time to glaucoma post surgery. The following risk factors were evaluated; age at cataract surgery, presence of systemic anomalies, microcornea, persistent primary hyperplastic vitreous, primary capsulotomy/anterior vitrectomy, primary IOL implantation, secondary membrane surgery and duration of post operative observation.
Results: The statistical methods were the use of Kaplan-Meir survival analysis and multivariate cox hazards regression analysis. Mean follow up was 6.3 3 5.0 years (median 4.6 years; range 0.5 - 20.3 years). Glaucoma developed in 36 of 234 patients (15.4%). Multivariate cox proportional hazards regression analysis identified age less than 9 months at time of surgery (rr 2.9, 95% ci 1.3-7.7; p=0.03), microcornea (rr 3.7, 95% ci 2.0-7.0; p<0.001), and follow up time as important predictors of glaucoma. PHPV (rr 1.4, 95% ci 0.7-2.7; p=0.41) and primary posterior capsulotomy/anterior vitrectomy (rr 2.2, 95% ci 0.9-5.5; p=0.17) were not significantly associated with secondary glaucoma in the multivariate model. Mean time to glaucoma after congenital cataract surgery was 4.9 years (range 2 weeks to 16.8 years).
Conclusion: Secondary glaucoma is an important sequelae in patients who undergo surgery for congenital cataracts. The risk for glaucoma is increased in those who underwent surgery prior to 9 months of age or had microcornea. It is imperative that these patients get life long surveillance as glaucoma can occur years after initial operation.

9.4.11.4. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucomas following intraocular surgery: Glaucomas associated with corneal surgery

P287 LONG TERM OUTCOMES OF GLAUCOMA SURGERY FOR POST-KERATOPLASTY GLAUCOMA IN ASIAN EYES

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Objective: To compare the intraocular pressure outcome and cornea graft survival in patients with post-keratoplasty glaucoma who had undergone trabeculectomy, glaucoma drainage device surgery or diode transscleral cyclophotocoagulation.
Design: A retrospective systematic review of clinical records of patients with refractory post-keratoplasty glaucoma that required glaucoma surgery was conducted.
Participants: Seventy eyes of 68 patients were studied. The patients with refractory glaucoma had underwent glaucoma surgery at the Singapore National Eye Centre from July 1991 to September 2004.
Intervention: The glaucoma surgeries included trabeculectomy, glaucoma drainage device and diode transscleral cyclophotocoagulation.
Main outcome measures: Two primary outcomes were evaluated: intraocular pressure control and graft status. In terms of intraocular pressure control, success was defined as IOP of between 6 to 21 mmHg with and without medication and failure was defined as IOP > 21 mmHg or < 6 mmHg, loss of light perception or requiring further glaucoma surgery. Corneal graft failure was diagnosed by persisent stromal edema lasting beyond 1 month of intense steroid therapy, or the development of vascularisation or scarring of the graft.
Results: The mean age was 53.5 years. There were 52 males and 16 females. Mean follow-up time was 66.1 months. The number of eyes with trabeculectomy, glaucoma drainage device and diode transscleral cyclophotocoagulation were 42, 15 and 13 respectively. There were no differences between the 3 groups in terms of age, gender, race or pre-existing glaucoma. Kaplan-Maier analysis showed that trabeculectomy had both better intraocular pressure outcome (p=0.042) and graft survival (p=0.022) than glaucoma drainage device and diode transscleral cyclophotocoagulation.
Conclusions: Trabeculectomy was found to be superior to glaucoma drainage device and diode transscleral cyclophotocoagulation in terms of both IOP control and graft survival for the surgical management of refractory post-keratoplasty glaucoma.
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9.4.15. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Glaucoma in relation to systemic disease

P288 SLEEP APNEA SYNDROME IS ASSOCAITED WITH GLAUCOMA

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Purpose: To determine any association between patients with concurrent diagnoses of sleep apnea syndrome (SAS) and glaucoma. And consequently whether SAS represents a risk for glaucoma.
Design: A retrospective records review was undertaken to identify unique patients who had diagnostic codes for sleep apnea and glaucoma. Participants and controls records of all patients seen at the Birmingham, Alabama Veterans Affairs Medical Center (BVAMC) between january 1, 2003 and december 31, 2005 were searched. Those who had an eye examination based on one of the following procedure codes (92014, 92004, 92002, 92012) and a diagnostic code (ICD-9) for either sleep apnea (327.20, 327.21, 327.23, 327.27, 327.29, 780.51, 780.52, 780.57) or glaucoma (365.xx) were included.
Methods of testing: Data were entered into a specially designed database for sorting and merging.
Statistical analyses: SPSS version 12 was used to produce crosstabs and to conduct a bivariate logistic regression that examined the relationship between sas and glaucoma.
Main outcome measures: Strength and significance of statistical association between SAS diagnosis and glaucoma diagnosis.
Results: 70,960 unique records were searched. 2,725 (3.8%) patients had a diagnosis of sleep apnea, 228 (8.37%) of this group also had a diagnosis of glaucoma. Glaucoma alone was present in 3,410 (5.00%) patients among 68,235 patients without sleep apnea. Logistic regression analysis yielded an odds ratio of 1.736, ($p<0.001$) favoring a diagnosis of glaucoma in the presence of co-existing sleep apnea suggesting that individuals with SAS are much more likely to have a coexisting diagnosis of glaucoma than individuals without SAS.
Conclusions: Glaucoma is present in a high prevalence in this population (5.00%), compared to the general population of the US. An even higher prevalence of glaucoma is present among patients with a diagnosis of sleep apnea (8.4%) compared to the general population (4.4% 6.6%, EST). SAS represents a significant risk factor for glaucoma and should be considered when managing patients who report a diagnosis of SAS.
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P289 ASSOCIATION BETWEEN SLEEP APNEA SYNDROME AND GLAUCOMA

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Purpose: The consequences of sleep apneas in patients with obstructive sleep apnea (OSA) syndrome may influence the function of visual system. The goal of the study was an assessment of the association between sleep apnea syndrome and glaucoma.
Design: Case series.
Participants: Forty-one patients with OSA syndrome and apnea/hypopnea index (AHI) of 50+-20.
Methods: In 41 patients with OSA syndrome the detailed ophthalmologic studies, including tonometry, pachymetry, biomicroscopic evaluation of the anterior segment of the eye, perimetry, stereoscopic examination of the eye, and HRT have been performed.
Main outcome measures: Visual acuity, IOP, corneal thickness, HRT, optic disc changes.
Results: In 6 patients (14,6%) the signs of lesions in the optic tract have been found. These were defects in visual field caused by glaucoma (primary open angle glaucoma and normal tension glaucoma) in 4 patients and defects in visual field (concentric and quadrantic homonymous) caused by diffuse lesions in the cortico-nuclear tract in 2 patients. In patients with the lesions in the optic tract there were severe disorders of breathing during sleep: AHI>60, mean SAO2 at the end of the apneas < 86% and minimal SAO2 at the end of apneas < 70%.
Conclusions: We conclude that in OSA patients there is a high risk of the lesions of the optic tract as a consequence of severe and repetitive hypoxemia during sleep.
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P290 SECONDARY GLAUCOMA IN PATIENTS WITH FAMILIAL AMYLOIDOTIC POLYNEUROPATHY: LONG-TERM FOLLOW-UP

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Purpose: To elucidate the clinical features and surgical outcomes of secondary glaucoma associated with transthyretin (TTR)-related familial amyloidotic polyneuropathy (FAP) in long-term follow-up.
Design: Retrospective, consecutive case series.
Participants: Fifty-three Japanese patients with FAP. The TTR mutations included amyloidogenic TTR val30met in 46 patients and ATTR tyr114cys in 7 patients.
Methods: For all patients, measurement of best corrected visual acuity, intraocular pressure (IOP), and visual fields as well as slit lamp and ocular fundus examinations were conducted and compared. An IOP equal to or lower than 21 mmHg with/without adjunctive medication was accepted as success.
Main outcome measures: IOP and incidence of complication.
Results: Secondary glaucoma was detected in 10 (22%) patients with val30met and 6 (86%) patients with tyr114cys. Statistical analyses revealed significant relationships between the onset of secondary glaucoma and both amyloid deposition ($p<.001$) and vitreous opacity ($p<.001$). Of 16 glaucomatous patients, surgical treatment was required in 22 eyes of 14 patients. The mean period between the onset of FAP and glaucoma was 8.0 years. The mean follow up period after surgical treatment was 3.1 years. Nineteen eyes (86%) underwent trabeculectomy with MMC; 2 eyes, combined trabeculotomy and sinusotomy; 1 eye, nonpenetrating trabeculectomy. Success rate was 32% and a half of 22 eyes needed additional surgical treatment. Unique frequent complications included encapsulated bleb (8 eyes, 36%) and ocular decompression retinopathy (4 eyes, 18%).
Conclusion: The pathogenesis of FAP may contribute to the high incidence of encapsulated bleb and ocular decompression retinopathy. Development of effective surgical modality for secondary glaucoma associated with FAP is needed.
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9.4.20. Clinical forms of glaucomas: Glaucomas associated with other ocular and systemic disorders: Other

P291 INVESTIGATING THE RELATIONSHIP BETWEEN SERUM CHOLESTEROL LEVEL AND TRIGLYCERIDE WITH GLAUCOMA

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Introduction: Glaucomas are a family of chronic, slowly progressive ocular disease in which increased intraocular pressure may cause optic atrophy and loss of visual field and blindness. Prevention is more important than treatment in glaucoma. Since the increase in the level of serum lipids is related to many systematic and unsystematic diseases, we assumed that it has a probable relation with glaucoma too.
Purpose: To investigate the relationship between serum cholesterol level and triglyceride with glaucoma.
Method: This study was performed on eighty witnesses, forty of them glaucoma patients and the other half healthy people, who were matched in age and gender by pair assimilation technique. First, glaucoma patients were diagnosed in a professional clinic. Then, witnesses were selected from ENT. Patients and their relatives who referred to Valie-ASR Hospital (Birjand, Iran). The condition for healthy relatives was not having diseases such as diabet, cardiovascular, and hypertension. Also their genealogy should be glaucoma-free. These patients were asked to eat nothing for twelve hours before blood tests and not to take antiglaucoma medicine three days before the tests. Statistic information was processes in SPSS and the results were expressed in terms of chi-square and t test ($p<0.05$).
Results: It was noticed that the number of open-angle glaucoma patients was higher than the closed-angle glaucoma patients. As to genealogy, the number of patients with negative genealogy was higher than those with positive ones. As to the curing method applied, the most widespread method was medical treatment. The mean cholesterol in both cases and witnesses (control) was 211.18 and 162.38 mg/lit respectively. A meaningful difference was observed between the means of the two groups which in patients was considerably more then the witnesses. The means of triglyceride in both patients and witnesses was (165.92-99.46) considerably higher.
Conclusion: This study has shown that high serum cho-

lesterol and triglyceride levels are a significant risk factor in glaucoma.

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10. DIFFERENTIAL DIAGNOSIS, *E.G.*, ANTERIOR AND POSTERIOR ISCHEMIC OPTIC NEUROPATHY

P292 FREQUENCY OF NONARTERITIC ANTERIOR ISCHEMIC OPTIC NEUROPATHY IN GLAUCOMA PATIENTS

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Purpose: To evaluate the frequency of nonarteritic anterior ischemic optic neuropathy (NAION) in patients with glaucoma

Design: Retrospective, descriptive study.

Participants: Six hundred and ninety eight glaucoma patients [primary open-angle glaucoma (n:462), pseudoexfoliation glaucoma (n:148), normal-tension glaucoma (n: 88)].

Methods: Review of clinical records.

Main outcome measures: We determined the presence of NAION in glaucoma patients.

Results: There were 344 female (49.7 %), and 354 male (50.7 %). The mean age was 62.2 years. We detected NAION in 5 primary open-angle glaucoma patients (1.08%), and 1 pseudoexfoliation glaucoma patient (2 eyes) (0.67%). NAION was present in 0.85% of 698 glaucoma patients.

Conclusion: NAION may occur in patients with glaucoma and other risk factors for NAION.

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P293 SUPERIOR SEGMENTAL OPTIC NERVE HYPOPLASIA IN YOUTH: IMPLICATION FOR DIFFERENTIATION BETWEEN NTG AND SSOH

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Purpose: Recently it has been revealed that prevalence of normal-tension glaucoma (NTG) is higher than ever thought. To diagnose NTG, it is essential to rule out congenital, segmental optic nerve hypoplasia. However, clear criteria for their differential diagnosis have not yet been established. In this paper, we analyzed the clinical features of young patients with superior segmental optic nerve hypoplasia (SSOH).

Design: Prospective observational case series.

Participants: Twelve eyes from eight patients (5 male and 3 female with a mean age of 14.9±3.3 years) who had an inferior wedge-shaped visual field defect (VFD), and who had normal visual acuity, intraocular pressure, and chamber angle.

Methods: Their visual fields were followed up on using both Goldman and Humphrey perimetries. In addition to funduscopic observation of the optic disc, the DM:DD ratio and the position of the central retinal artery entrance on the disc were measured from fundus photographs. The optic disc area was measured with the Heiderberg retina tomography (HRT). Some cases underwent the multifocal ERG (mERG) and the magnetic resonance imaging (MRI).

Main outcome measures: VFD, the indicator of optic nerve hypoplasia, is not closely correlated to the optic disc morphology.

Results: In all cases, the Goldman perimetry showed inferior wedge-shaped VFD, observed in both inner and outer isopters, directed to the blind spot; severe cases were associated with similar superior VFD. In the Humphrey perimetry this characteristic finding was sometimes obscure, but discontinuity between the VFD and the blind spot was revealed in milder cases. These VFD did not progress during 7.0±1.3 years, which confirmed the diagnosis of SSOH. The optic disc was not always small: the DM:DD ratio and HRT revealed small discs in only two or three eyes. Broad retinal nerve fiber layer defect (NFLD) was always observed in the direction corresponding to the visual field defect. None of them showed 'topless disc' appearance ' in all the cases in this series, the central retinal artery was positioned on the middle level of the optic disc. In seven eyes 'double ring sign' was associated and in five eyes the nasal neural rim was obviously thin. Additionally, mERG was tested but no abnormality was observed. In two eyes coronal thin slice for the orbit MRI revealed significant thinning of the optic nerve.

Conclusions: Mutifocal ERG and MRI findings indicate that the origin of VFD is optic nerve abnormality. The eyes studied in this series can be diagnosed with SSOH from the non-progressive wedge-shaped VFD observed by Goldmann perimetry. In patients of this age NTG is less possible. However, their optic discs have no 'topless' appearance, and are not always small. Instead, double ring sign and nasal neural rim thinning are more suggestive for SSOH. Thus, to diagnose SSOH, it is not the optic disc morphology but rather the characteristic VFD by the Goldmann perimetry and correspondent broad NFLD that are requisite.

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11. MEDICAL TREATMENT

11.1. Medical treatment: General management, indication

P294 CLINIC-BASED OBSERVATIONAL STUDY OF GLAUCOMA PATIENT DISTRIBUTION AND DRUG PREFERENCE IN JAPANESE COMMON CLINICS

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Purpose: To evaluate the distribution of glaucoma patients and preferences of anti-glaucoma drug usage in Japanese common clinics.
Design: A cross-sectional observational study.
Participants: A total of 4119 eyes from 2176 cases who visited the 33 clinics and 44 doctors in the Kyoto and Shiga districts from January 1st to February 28th, 2006 were enrolled.
Methods: The intraocular pressure (IOP), visual field (VF), glaucoma type (primary open angle glaucoma (POAG); normal tension glaucoma with high teen IOP (NTG_HI); NTG with low teen IOP (NTG_LO); ocular hypertension (OHT); other types of glaucoma (others)), age, and drug usage of each patient were recorded and analyzed. All doctors were asked to self-declare their subspecialty and were then divided into two groups, glaucoma specialists (g group) and general ophthalmologists (non-g group). Glaucoma drug preference was compared in each glaucoma type, stage, and physician's subspecialty.
Main outcome measures: The distribution of glaucoma type, stage, preferred anti-glaucoma drugs were compared.
Results: The distribution of each glaucoma type was 1474, 636, 476, 556, and 878 eyes in POAG, NTG_HI, NTG_LO, OHT, and others, respectively. That of glaucoma stage was 2244, 870, and 466 eyes for early, intermediate, and end-stage, respectively. The most preferred anti-glaucoma drugs were PGS. Those patients who received more than three glaucoma drugs were 36.9% and the rate increased as the stages progressed. The proportion of drug-free patients was 9.9% in POAG, more than 25% in NTG and OHT, and 33.8% in others. The mean IOP was kept low in the following order, NTG_LO, NTG_HI, POAG, others, and OHT. As for the physician's subspecialty, more patients with end-stage glaucoma visited the g group (9 clinics, 12 doctors) than the non-g group (26 clinics, 32 patients); 18.8 vs. 9.5%, respectively. Only the mean IOP of NTG_LO in the g group was significantly lower than that in the non-g, while others showed no differences between the two groups.
Conclusions: The distribution of glaucoma patients in this study showed a strong cooperation among the clinics. Except for the NTG_LO patients, there were few differences between the g and non-g groups in the preference of glaucoma therapy.

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P295 VISUAL FUNCTION CHANGES AFTER INTRAOCULAR PRESSURE REDUCTION USING ANTIGLAUCOMA MEDICATIONS: A RANDOMIZED CLINICAL TRIAL

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Purpose: To evaluate the correlation between intraocular pressure (IOP) reduction and visual function changes in primary open-angle glaucoma (POAG) patients after using antiglaucoma medications.
Design: Prospective randomized clinical trial.
Participants: Fifty-four glaucomatous patients (54 eyes) without use of antiglaucoma medications were enrolled in this study.
Methods: After inclusion, the patients randomly received one of the three following medications: timolol maleate 0,5% , brimonidine tartrate 0,2% or travoprost 0,004% in one randomly selected eye. The patients underwent Goldmann applanation tonometry, visual acuity test, contrast sensitivity test (CS), visual quality perception test (visual analogue scale) and standard automated perimetry in a random sequence before and after 4 weeks of glaucoma treatment onset.
Main outcome measures: Intraocular pressure, contrast sensitivity and visual quality perception test results.
Results: after the 4-week treatment, all three drugs reduced IOP effectively. There were statistically significant changes in SAP mean deviation, visual quality perception and CS in higher frequencies (12 and 18 cycles/degree). No significant correlations between IOP reduction and visual function changes were found.
Conclusions: These data suggests that patient's visual subjective analysis, visual field MD and CS at higher frequencies improves after the onset of glaucoma therapy. However, its association with IOP changes deserves further studies to be confirmed.
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11.3.3. Medical treatment: Adrenergic drugs: Apraclonidine, brimonidine

P296 EFFECT OF TOPICAL ANTIGLAUCOMA MEDICATIONS ON RABBIT CORNEA AND CONJUNCTIVA

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Purpose: To evaluate the effects of timolol, brimonidine and the preservatives in them on corneal epithelial cells and the histopathology of rabbit conjunctiva.
Design: Experimental study.
Participants: Fifteen New Zealand white rabbits without clinically evident ocular surface diseases.
Methods: Fifteen New Zealand white rabbits weighing 1.5 to 2.5 kg were randomly divided into three groups. One group with three rabbits served as untreated controls. Timolol 0.5% and brimonidine 0.2% each were administered to the rights eyes in one treated group, and the preservatives (0.02% thiomersal in timolol, 0.005% benzalkonium chloride in brimonidine) to the left eyes, twice a day for 30 days. Corneal epithelial damage was evaluated by scanning electron microscopy, and conjunctival specimens were examined by light microscopy.
Main outcome measures: Corneal damage rating score, number of conjunctival inflammatory cells.
Results: Compared with normal controls, both the topical antiglaucoma medications and the preservatives caused corneal epithelium damage and increased number of inflammatory cells in the conjunctiva. Brimonidine produced significantly more damage than timolol ($p = 0.003$) in corneal epithelium. The mean corneal damage scores with benzalkonium chloride (BAK) were significantly higher than with thiomersal ($p = 0.003$). In the conjunctival tissue, the number of inflammatory cells in the epithelium was significantly higher in eyes treated with brimonidine or BAK than in eyes treated with timolol or thiomersal ($p < 0.05$).
Conclusions: When applied to rabbit eyes, brimonidine and timolol and the preservatives result in corneal damage and conjunctival inflammatory cell infiltration. Brimonidine and BAK appear to have more influences on ocular surface compared with timolol and thiomersal. The morphologic change in the conjunctiva may relate to failure of filtering blebs.
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P297 META-ANALYSIS OF THE USE OF RANDOMISED CONTROLLED TRIALS COMPARING TIMOLOL WITH BRIMONIDINE IN THE TREATMENT OF GLAUCOMA.

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Purpose: To compare the efficacy and tolerability of timolol versus brimonidine in the treatment of glaucoma.
Design: This is a systematic review of all literature of randomized controlled trials which compare the use of timolol versus brimonidine in a head to head comparison.
Method: Comprehensive searches were performed using Medline, Embase and the Cochrane Controlled Trials Register for randomised controlled trials comparing timolol and brimonidine. Two reviewers independently assessed trials for eligibility and quality and extracted data. A random effects model was used to combine studies. Outcome was defined as the absolute mean intraocular pressure (IOP) reduction from baseline to end point for efficacy, and relative risk (RR) for adverse events. Subgroup analysis and regression were used to explore heterogeneity according to trial design and quality.
Main outcome measures: The peak IOP reduction (IOPR) from baseline to end point was determined. Further results on the influence on contrast sensitivity and nerve fibre layer thickness were also commented upon. We also reviewed the most common adverse events.
Results: Ten publications reporting on 8 trials with 2464 participants were included in the meta-analysis. Two further trials were commented on qualitatively. IOP reduction was not significantly different between timolol and brimonidine. Weighted mean difference (WMD) of IOP reduction was 0.24 mmHg (favouring brimonidine) with a 95% confidence interval (CI) of 0.03 to 0.38 mmHg. There was significant heterogeneity between studies (213 = 102.68, p < 0.00001, i2 = 91%). Subgroup analysis showed no significant WMD for studies where data were analysed from end points ³6 months or < 6 months duration, multiple regression analysis showed no significant association of WMD with trial duration (t3 = 1.27, p = 0.24), quality (t3 = 0.05, p = 0.96) or size (t3 = '0.78, p = 0.46). The relative risk of ocular allergy was much lower with timolol than brimonidine (rr = 0.06, 95% ci 0.01 to 0.24). Publication bias was not evident on a funnel plot.
Conclusion: Both drugs are equally effective in lowering IOP. Brimonidine is associated with a higher rate of allergy.

P298 INHIBITION BY BRIMONIDINE OF FORSKOLIN-INDUCED NITRIC OXIDE SYNTHASE EXPRESSION IN HUMAN CILIARY BODIES IN VITRO

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Purpose: To investigate the mrna and protein expression of

nitric oxide synthase (NOS) in human ciliary bodies in vitro. The effect of the adenylcyclase activator forskolin and/or the a2-adrenergic agonist brimonidine (an ocular hypotensive agent that inhibits aqueous humor formation) on NOS, MRNA or protein expression was also studied.
Methods: Frozen human ciliary bodies obtained from local eye bank were thawed and incubated with 0.1 µm forskolin for 24h in the absence or in the presence of 10 µm brimonidine. The MRNA and protein expression of three NOS isoforms (neuronal NOS or nNOS, inducible NOS or iNOS, endothelial NOS or eNOS) were assessed by reverse transcription-polymerase chain reaction (rt-PCR) and western blot analysis, respectively.
Results: MRNA and protein expression of three nos isoforms were detected in human ciliary bodies. Forskolin significantly up-regulated the MRNA and the protein expression of nNOS, but neither the one of iNOS nor of eNOS. In the presence of brimonidine, the forskolin-induced up-regulation of nnos MRNA or protein expression was significantly inhibited.
Conclusions: In human ciliary body (where aqueous humor is produced), brimonidine inhibits the up-regulation of nNOS expression induced by forskolin.
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P299 RANDOMIZED, PARALLEL COMPARISON OF THE EFFICACY AND TOLERABILITY OF TWICE-DAILY COMBIGAN® VS. COSOPT® FIXED-COMBINATION THERAPIES IN PATIENTS WITH GLAUCOMA OR OCULAR HYPERTENSION
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Objective: Although an effective monotherapy is ideal for lowering of intraocular pressure (IOP), most patients eventually require more than a single medication to reach sufficiently low target pressures. Fixed combination products have been shown to effectively lower IOP and may increase compliance. The purpose of this study was to determine the efficacy and tolerability of fixed combination 0.2% brimonidine/0.5% timolol (Combigan®) vs. 2.0% dorzolamide/0.5% timolol (Cosopt®) in patients with glaucoma or ocular hypertension.

Design: Pooled analysis of two investigator-masked, randomized, 3 month-parallel comparison studies performed at 10 sites with identical protocols.
Participants: Patients with open angle glaucoma or ocular hypertension requiring additional IOP lowering (n=180).
Methods: Patients were washed out from all topical glaucoma medications except prostaglandin analogs (PG) and then divided into fixed-combination (n=101) and prostaglandin (PG) adjunctive (n=79) groups. Patients in the fixed-combination group were randomized to receive either Combigan or Cosopt twice daily and those in the adjunctive group were randomized to receive either Combigan or Cosopt twice daily in addition to their topical PG.
Main outcome measures: Assessment of efficacy was based on mean IOP. The evaluation of tolerability was based on patient-rated stinging, burning, and unusual taste on a questionnaire. Ocular allergy was not measured.
Results: There were no statistical differences in baseline IOPS between Combigan- and Cosopt-treated eyes in either the fixed-combination (23.0 and 23.6 mmHg, p=0.522) or the PG adjunctive groups (21.9 and 21.0 mmHg, p=0.277). After 3 months, the mean IOP was 15.6 mmHg for Combigan and 17.2 mmHg for Cosopt treated eyes (p=0.031) as fixed-combination, and 15.3 mmHg for Combigan and 16.1 mmHg for Cosopt (p = 0.391) treated eyes as adjunctive to a PG. The mean decrease from baseline was 7.7 mmHg (32.3%) for Combigan and 6.7 mmHg (26.1%) for Cosopt (p=0.275) as fixed-combination and 6.9 mmHg (28.4%) for combigan and 5.2 mmHg (23.5%) for Cosopt (p=0.098) adjunctive to a PG. Patients treated with Combigan reported significantly less stinging (p<0.001), burning (p<0.001), and unusual taste (p<0.001) than patients treated with Cosopt.
Conclusions: In this pooled data set, Combigan provided at least comparable or greater IOP lowering than Cosopt. Combigan appears to have a better tolerability profile than Cosopt.
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11.3.4. Medical treatment: Adrenergic drugs: Betablocker

P300 EFFECTS OF CARTEOLOL HYDROCHLORIDE ON VARIATION OF 24-HOUR INTRAOCULAR PRESSURE IN NORMAL-TENSION GLAUCOMA
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Purpose: To study the effect of carteolol on variation of the 24-hour intraocular pressure (IOP) in patients with normal-tension glaucoma (NTG).

Design: Case-controlled study.
Participants: Ten NTG patients.
Methods: A total of 10 eyes from 10 (3 male, 7 female) NTG patients were studied. If the patient was receiving an antiglaucoma drug, the drug was first withdrawn for at least 4 weeks after which the patient was hospitalized to measure the 24-hour IOP prior to the initiation of therapy. After performing carteolol ophthalmic solution 2% monotherapy in both eyes for 8 weeks, the 24-hour IOP was remeasured. IOP was measured at 10 am, 1 pm, 4 pm, 7 pm, 10 pm, 1 am, 3 am, and 7 am using a Goldmann tonometer in the sitting position. Blood pressure and pulse rate were measured twice daily (am and pm) both before and after therapy.
Main outcome measures: 24-hour IOP variation.
Results: The IOP after therapy with carteolol 2% was significantly reduced at 7 am, 10 am, 1 pm, and 4 pm. In addition, the maximum IOP and IOP range were also significantly reduced (maximum IOP: before therapy: 17.0±2.6 mmHg; after therapy: 15.9±2.2 mmHg, $p<0.05$) (IOP range: before therapy: 4.3±1.6 mmHg; after therapy: 3.0±1.1 mmHg, $p<0.05$). A significant reduction was observed in both the systolic blood pressure in the morning and the diastolic blood pressure in the afternoon. No significant change was observed in pulse rate, either in the morning or afternoon.
Conclusions: Carteolol significantly reduced IOP without affecting pulse rate, especially in the daytime. Carteolol is therefore highly effective for the treatment of NTG.
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P301 EVALUATION OF MAJOR DEPRESSIVE DISORDER IN PATIENTS RECEIVING CHRONIC TREATMENT WITH TOPICAL -BLOCKERS
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Objective: Screening and provisional diagnosis of depression disorders in patients receiving chronic topical ß-blocker therapy for glaucoma and referral for detailed psychiatric evaluation and management if indicated.
Design: Cross-sectional observational study.
Participants: Fifty patients with confirmed diagnosis of glaucoma and receiving chronic treatment (> 6 months) with topical ß-blockers treatment were selected from the glaucoma follow-up clinic and evaluated for major depressive disorder (MDD). Patients receiving systemic ß-blockers as well as other systemic medication for any unrelated diseases were excluded. Patients with other unrelated chronic illness were also excluded.
Methods: The selected patients were screened using the brief patient health questionnaire (BPHQ) designed for screening and diagnosis of mental disorders. The prime md todaytm (primary care evaluation of mental disorders) is based on criteria from the American Psychiatric Association's Diagnostic and Statistical Manual III R and IV (DSM-III R and IV) which was designed to assist in screening, evaluating and provisionally diagnosing major depression (fig 1). Any past history of psychiatric illness or significant family history was also taken into consideration. Any recent history of untoward incident in life was also included in the details recorded.
Outcome measures: To diagnose MDD based on the summary of the responses derived from the self administered questionnaire.
Results: Of the 50 patients screened for the depressive disorder, 8 patients had criteria satisfying that of MDD (16%). The mean duration of treatment with topical ß-blockers in patients diagnosed with depressive disorders was 76 days (md ± 24.9) and all the patients were on continuous treatment since the diagnosis of glaucoma was confirmed. No patient had history of psychiatric illness in the past nor was any familial predisposition found. None of the diagnosed patients were on antipsychotic medication or any other systemic medication. None of the affected patients were practicing punctual occlusion following instillation of the medicine.
Conclusion: The patients receiving chronic therapy with timolol should be screened for MDD and referred for appropriate psychiatric consultation and treatment if Indiacted.
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11.4 Medical treatment: Prostaglandins

P302 EFFICACY OF LATANOPROST IN MANAGEMENT OF CHRONIC ANGLE CLOSURE GLAUCOMA
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Objective: To study the effect of latanoprost 0.05% on intraocular pressure (IOP) in subjects diagnosed as having chronic angle closure glaucoma (CACG).
Design: Open label study.
Participants: Forty-four patients participated in the study, out of whom 20 were males and 24 were females.
Methods: Forty-four patients with bilateral CACG were treated with latanoprost 0.05% once daily at bedtime. IOP was recorded at baseline, 2 weeks, 4 weeks, 8 weeks and 12 weeks after starting the treatment.
Main outcome measures: The major parameter studied was the change in IOP after administration of latanoprost.
Results: The mean age of the study sample was 50.35 years (40-65 years). There were 20 males and 24 females in the study. Mean IOP at baseline was 23.25+3.01. Mean IOP decreased to 16.32+2.8 at 2 weeks, 16.03+4.10 at 4 weeks, 16.01+2.9 at 8 weeks and 16.00+3.12 at 12 weeks. There was a statistically significant reduction in mean IOP

at 2 weeks as compared to baseline IOP (p<0.000). Mean reduction in IOP at 2 weeks was 6.28+4.73.
Conclusion: Latanoprost, a prostaglandin analogue is effective in reducing IOP in chronic angle closure glaucoma patients. The significant reduction in IOP is evident by 2 weeks, and there is no further significant reduction, however the initial significant improvement was maintained till the end point of the study.
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P303 EFFECT OF TRAVOPROST ON CENTRAL CORNEAL THICKNESS IN PATIENTS WITH PRIMARY OPEN ANGLE GLAUCOMA AND OCULAR HYPERTENSION: A LONG-TERM STUDY
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Purpose: To determine the the long-term effect on central corneal thickness (CCT) of travoprost in patients with primary open angle glaucoma (POAG) and ocular hypertension (OH).
Design: A retrospective analysis.
Participants and controls: Thirty-five patients were using travoprost 0,004%, 12 patients were using timolol 0,5% and 19 patients were under no treatment (controls).
Methods and Main outcome measures: CCT using ultrasound pachymetry (Tomey AL-2000) and intraocular pressure (IOP) by Goldmann tonometry were measured at the begining (initial CCT, IOP) and after 12 months of treatment (final CCT, IOP). T-tests and anova analysis were used to compare data.
Results: Travoprost group: mean initial CCT was 549 (sd 24) nm and mean final CCT was 538 (sd 26) nm (p=0,000). Timolol group: 561(sd 44) nm initial CCT and 558 (sd 43) nm final CCT (p=0,812). Untreated group: 562 (sd 44) nm initial CCT and 554 (sd 35) nm final CCT (p=0,069). The mean IOP was significantly reduced both in travoprost (from 19,7 to 14,9 mmHg, p=0,000) and timolol group (from 18,3 to 14,0 mmHg p=0,036) and unchanged in untreated group (15,5 vs 14,6 mmHg p=0,154).
Conclusions: CCT measured by ultrasound pachymetry decreases during treatment with travoprost in patients with POAG and OH.
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P304 A HISTOPATHOLOGICAL STUDY OF IRIS CHANGES IN PSEUDOEXFOLIATIVE GLAUCOMA IN PATIENTS TREATED WITH XALATAN
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Objective: The aim of this study is to observe the iris changes in patients with pseudoexfoliative glaucoma after they have been treated with Xalatan for a different period of time.
Methods: We observed 14 patients with pseudoexfoliative glaucoma. Thirteen of them were treated with Xalatan for a different period of time. Two of the patients were treated for 3 months, 1 of the patients took Xalatan for 6 months, 3 of the patients for 1½ year, 2 patients for 2 years, 4 patients were treated for 3 years and 1 patient was treated with Xalatan for 4 years. Four of the patients had Xalatan as a monotherapy before trabeculectomy. The other 9 patients had additional therapy, apart from Xalatan. All patients in this study were examined at the University Eye Hospital, Cologne, before undergoing trabeculectomy. Iris material was taken from all the patients at the time of the operation in order to be studied by electron microscopy.
Results: We studied the ultrastructure of iridectomies, obtained from patients with and without latanoprost treatment. We have looked at the ultrastructure of blood vessels (endothelium, basement membrane), stromal cells (semiquantitative estimation of melanine content; presence of melanophages), and stromal connective tissue (density and diameter of collagen fibers).
Conclusion: We observed no pathological changes in any of the iris specimens. There were no differences between treated and controlled specimens.
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P305 ABSENCE OF IN VITRO TOXICITY OF TRAVOPROST 0.004% WITHOUT BENZALKONIUM CHLORIDE (BAK) COMPARED TO PROSTAGLANDIN FORMULATIONS CONTAINING BAK

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Purpose: This study compared the toxicity of topical IOP lowering agents, travoprost z 0.004%, a new formulation without benzalkonium chloride (BAK), travoprost 0.004% with 0.015% BAK and latanoprost 0.005% containing 0.02% BAK in an in vitro model using Wong-Kilbourne derivative Chang conjunctival cells.
Methods: Neutral red, alamar blue, yopro-1, and annexin v-7aad assays were used to evaluate the effects of the IOP lowering agents and BAK on cellular viability, membrane integrity, cytotoxicity, and apoptosis in the conjunctival cell line using microtitration fluorimetric analysis and flow cytometry.
Results: Assessment of cell viability and membrane integrity demonstrated a significant effect by latanoprost with BAK and BAK alone, but no effect by travoprost z or buffer alone ($p < 0.0001$). Latanoprost with BAK and BAK alone were cytotoxic in Chang conjunctival cells, while no cytotoxicity was observed in cells exposed to travoprost z without BAK or cells treated with buffer ($p < 0.0001$). No significant increase in apoptosis or necrosis was observed in cells treated with pbs, or travoprost z without BAK compared with BAK and latanoprost with BAK ($p < 0.0001$). Travoprost with BAK exhibited significant less toxicity than latanoprost with BAK but more than travoprost z ($p< 0.0001$).
Conclusions: Latanoprost with BAK had significant apoptotic-mediated cytotoxic effects on cultured conjunctival cells likely associated with the BAK used as a preservative. Travoprost with BAK showed intermediate toxicity between latanoprost with BAK and travoprost z without BAK. Glaucoma medication with an alternative preservative system, such as travoprost z, may result in a decrease in ocular surface side effects commonly observed with chronic, long-term exposure to IOP lowering medications containing BAK.
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P306 BIMATOPROST/TIMOLOL FIXED COMBINATION: A ONE-YEAR DOUBLE-MASKED, RANDOMIZED PARALLEL COMPARISON TO ITS INDIVIDUAL COMPONENTS IN PATIENTS WITH GLAUCOMA OR OCULAR HYPERTENSION

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Purpose: The objective of the present study was to evaluate the safety and efficacy of a fixed combination (FC) of 0.03% bimatoprost (bim) and 0.05% timolol (tim) (Hommer et al., 2007) compared to each of the active components for one year.
Design: Two identical double-masked, randomized, multicenter parallel studies.
Participants: A total of 1061 patients with glaucoma or ocular hypertension.
***Methods*:** FC (q.d., mornings), tim (q.d., evenings), or tim (b.i.d.).
Main outcome measures: Intraocular pressure (IOP).
Results: Mean decreases from baseline IOP at all follow-up visits across the diurnal timepoints ranged from 7.1 to 9.6 mmHg (FC), 6.7 to 8.8 mmHg (bim), and 5.1 to 7.4 mmHg (tim). The proportion of patients with a > 20% mean diurnal percent change from baseline in IOP across all visits (responders) was 68.1% (363/533), 58.1% (154/265) and 38.0% (100/263) for the FC, bim and tim groups, respectively ($p = 0.003$ for fc vs. bim and $p < 0.001$ fc vs. tim). The proportion of patients achieving a mean diurnal IOP < 18 mmHg at all visits (responders) was 43.5% (232/533), 35.8% (95/265), and 18.6% (49/263) for the fc, bim and tim groups, respectively ($p =0.021$ for fc vs. bim, and $p < 0.001$ for fc vs. tim). Statistical superiority of FC was also seen in the sub-group of patients who previously used prostaglandins/prostamides (n= 373). The most commonly reported treatment-related adverse event was conjunctival hyperemia, with the greatest incidence in bim, followed by FC and tim.
Conclusions: FC was clinically and statistically significantly more effective than bim and tim based on the responder analyses, better tolerated, and safer than bim with respect to common ocular adverse events. FC, a single-bottle, once-daily fixed combination, represents a convenient, therapeutic advantage over separate bottles.
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P307 IN VIVO CORNEAL EPITHELIAL PERMEABILITY FOLLOWING TREATMENT WITH PROSTAGLANDIN ANALOGUES WITH OR WITHOUT BENZALKONIUM CHLORIDE

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Purpose: To examine the effects of two IOP lowering agents, latanoprost with 0.02% BAK and travoprost z without BAK, on corneal epithelial permeability.
Methods: Corneal permeability was measured by uptake of the fluorescein tracer carboxyfluorescein in a rabbit cornea model (n = 12). Additionally, loss of epithelial tight junctions was measured by ruthenium red uptake with transmission electron microscopy. Data from each group were compared by one-way analysis of variance (Anova) or by student's t-tests.
Results: There was a significant difference between corneal epithelium permeability of rabbits exposed to travoprost z compared to latanoprost preserved with 0.02% BAK ($p < 0.0001$). There was no difference between control rabbits and rabbits receiving travoprost z ($p = 0.224$). Epithelial permeability was significantly increased in the corneas of rabbits exposed to latanoprost in the 3-minute drop test (2.16 ± 1.09 nm/s) and the 3-minute exposure (16.69 ± 3.15 nm/s) compared with control or travoprost ($p = 0.002$), likely due to the presence of 0.02% concentration of BAK in the latanoprost solutions. There was no detectable loss of epithelial tight junctions in corneas from control rabbits or rabbits receiving travoprost z compared to significant loss observed in corneas from rabbits exposed to the latanoprost solution preserved with BAK.
Conclusions: Agents such as travoprost z 0.004% with an alternative preservative system may decrease the toxicity associated with the long-term use of IOP lowering agents which contain BAK.
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P308 BRIMONIDINE PURITE 0.15% VERSUS DORZOLAMIDE 2% USED AS ADJUNCTIVE THERAPY TO LATANOPROST

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Purpose: Brimonidine has been shown to be an effective monotherapy and is a versatile adjunctive agent, possibly due to the dual mechanism of the drug. The purpose of this study was to compare the IOP-lowering efficacy and clinical success rates of brimonidine purite 0.15% with dorzolamide 2% as adjunctive therapy with latanoprost.
Design: Three-month, investigator-masked, multi-center, prospective, randomized clinical trial comparing the IOP-lowering efficacy and clinical success rates of brimonidine purite 0.15% with dorzolamide 2% as adjunctive therapy with latanoprost.
Participants: A total of 55 patients were randomized to either brimonidine purite 0.15% twice daily or dorzolamide 2% twice daily used as adjunctive therapy to latanoprost.
Methods: Patients with a diagnosis of open-angle glaucoma or ocular hypertension with an IOP of at least 16 mmHg after using latanoprost monotherapy for at least 6 weeks were randomized to receive either brimonidine purite 0.15% BID or dorzolamide 2% BID as adjunctive therapy for 3 months. Patients instilled their study medications at 8am and 8:15 pm. Latanoprost was instilled at 8pm. Patients were instructed not to instill their morning dose of study medication on the morning of their study visits. IOP was measured before instillation of the morning dose (trough effect) and 2 hours after instillation (peak effect). At the final study visit, the investigator completed a clinical success evaluation. Patients were judged to be clinically successful if the investigator recommended that the patient continue his or her assigned adjunctive treatment regimen.
Main outcome measures: IOP-lowering efficacy and clinical success rates.
Results: In an interim analysis of 40 patients, there was no significant between group difference in IOP at the latanoprost-treated baseline (20.7 mmHg with brimonidine purite and 21.2 mmHg with dorzolamide, $p=.557$). After 3 months, the additional mean IOP lowering provided by brimonidine purite at peak drug effect was 6.0 mmHg (28.4%), compared with 4.6 mmHg (21.9%) with dorzolamide ($p=.167$). Both regimens provided comparable additional IOP-lowering from the latanoprost-treated baseline at trough effect (2.7 mmHg, 12.9% with brimonidine purite and 2.9 mmHg, 13.2% with dorzolamide, $p=.810$). As evaluated by the masked investigators, brimonidine purite-treated patients were considerably more likely to be clinically successful than dorzolamide-treated patients (79% versus 50%, respectively, $p=.070$).
Conclusion: The addition of brimonidine purite to latanoprost provided greater additional IOP-lowering than the addition of dorzolamide.
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P309 A MULTICENTER EVALUATION OF THE EFFECT OF PATIENT EDUCATION ON ACCEPTANCE OF HYPEREMIA ASSOCIATED WITH BIMATOPROST THERAPY FOR GLAUCOMA OR OCULAR HYPERTENSION

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Purpose: Bimatoprost has been proven to be a safe and effective agent for long-term IOP-lowering. The most common side effect is mild and transient hyperemia. The purpose of this study was to evaluate the incidence of hyperemia in patients using bimatoprost and to determine if simple interventions result in increased understanding of glaucoma and hyperemia.
Design: Multicenter, open-label, evaluator masked trial.
Participants: A total of 64 patients were randomized to either group 1 or group 2.
Methods: Patients were randomized to intervention (group 1) or no intervention (group 2). For group 1, office staff were asked to review a fact sheet explaining the importance of IOP-lowering and the efficacy of bimatoprost. Patients were given this sheet to take home. Group 2 was instructed only to instill bimatoprost daily and was given no additional instructions. Visits were at baseline, days 1 and 7, month 1, and week 6. At each study visit, patients completed a questionnaire about any hyperemia and how it affected their willingness to continue bimatoprost.
Main outcome measures: Incidence in hyperemia and increased understanding of glaucoma and hyperemia.
Results: As graded by investigators, conjunctival hyperemia peaked 1 day after commencing bimatoprost, with a mean of 1.1 (0.5=trace, 1=mild, 2=moderate, 3=severe). By day 7, hyperemia levels were approximately trace (0.69) and continued to decrease throughout the study. At each visit, patients in group 2 were slightly more bothered by hyperemia than were patients in group 1. At each visit, group 1 was more likely than group 2 to report that lowering IOP was very important to preserving vision (for example, at day 7, 90% and 65%, respectively, p=.016). Group 1 was more likely than group 2 to be willing to continue to use bimatoprost, despite hyperemia (97% vs. 88% at day 1, p=.293).
Conclusions: Overall, hyperemia peaked at day 1 (to mild levels) and quickly returned to baseline. Patients in group 1 were more aware of the importance of IOP-lowering and were more willing to tolerate hyperemia. Most patients were not bothered by hyperemia. Patient education can improve patient acceptance of a prescribed regimen and potentially increase compliance.
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P310 LONG-TERM EFFECTS OF LATANOPROST MONOTHERAPY ON INTRAOCULAR PRESSURE IN JAPANESE GLAUCOMA PATIENTS

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Purpose: This study was conducted to assess the long-term effects of latanoprost monotherapy on intraocular pressure associated with glaucoma.
Design: Retrospective study.
Methods: The subjects were glaucoma patients who had been treated on an outpatient basis for five years or more at the glaucoma outpatient clinic of the university of yamanashi hospital with only latanoprost ophthalmic solution as the first drug of choice. Subjects who underwent treatment with a drug other than latanoprost, laser therapy or surgery were omitted from the study, and the intraocular pressure lowering effect of latanoprost, the dropout rate and causative reasons, and the types of additional therapy were assessed in a retrospective manner.
Results: One hundred and fifty eyes of 88 patients [age: 66.3 ± 13.7 years; 45 men (age: 64.7 ± 12.9 years) and 43 women (age 67.6 ± 14.5 years)] were examined. There were 82 eyes with normal tension glaucoma, 43 eyes with primary open angle glaucoma, 10 eyes with secondary open angle glaucoma, 9 eyes with primary angle closure glaucoma, and 6 eyes with other conditions. The mean duration of latanoprost monotherapy was 4.6 ± 1.4 years (minimum: 5 months, maximum: 6.8 years, median: 4.5 years). The intraocular pressure lowering rates (dropout rates indicated in parentheses) relative to the mean intraocular pressure prior to the start of latanoprost monotherapy (18.7 ± 4.4 mmHg) were 16.0% (6.7%), 19.8% (0.7%), 18.0% (0.7%), 19.8% (6.3%), 21.3% (10.7%) and 23.9% (24.4%) at 6 months, 1 year, 2 years, 3 years, 4 years and 5 years after the start of monotherapy, respectively, demonstrating a significant decrease compared with that prior to monotherapy, while also indicating that the dropout rates were higher at the earlier and later parts of the monotherapy. The intraocular pressure lowering rate was significantly lower among patients with normal tension glaucoma than among patients with other types of glaucoma. There were four eyes in which latanoprost monotherapy was discontinued due to the occurrence of adverse events in the form of reversible, local ophthalmic symptoms. Sixty eyes received latanoprost in combination with other drugs, and 10 eyes required surgery.
Conclusion: Latanoprost monotherapy demonstrated stable intraocular pressure lowering effect over the long term, and there was an approximately 50% probability of continuing latanoprost monotherapy for five years.
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P311 COMPARISON OF 24-HOUR POST-DOSE EFFICACY OF TRAVOPROST AND LATANOPROST WHEN MORNING-DOSED IN OPEN-ANGLE GLAUCOMA

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Introduction: Prostaglandin analogs for treating glaucoma are usually prescribed once daily in the evening because of superior efficacy vs. morning dosing, although patients often prefer morning dosing for convenience. With morning dosing, the trough effect of the drug coincides with the daily peak in intraocular pressure (IOP), which is usually in the early morning. Diurnal IOP control could thus be negatively affected if a prostaglandin with shorter duration of action is morning-dosed.
Purpose: To compare the IOP-lowering efficacy of morning-dosed travoprost vs. latanoprost at 24-hours post-dose and to determine if patient preference regarding dose timing affects drug efficacy.
Design: Prospective, randomized, investigator-masked, crossover clinical trial.
Participants: Open-angle glaucoma patients controlled with pm-dosed (2100) latanoprost (n=21) or travoprost (n=30).
Methods: Baseline IOP's with pm-dosing were measured at 0900. Subjects were randomized to received travoprost or latanoprost at 0900 for 4 weeks, and then crossed over to receive the 2nd prostaglandin for another 4 weeks. Treatment IOP was measured immediately prior to morning dose at both 4 and 8 week visits. Patient dosing preference (am vs. pm) was surveyed on exit.
Main outcome measures: IOP measured at 0900, patient dosing preference.
Results: For travoprost, baseline (pm-dosed) IOP was 17.9±0.5 mmHg; there was no change with am-dosing (17.1±0.6 mmHg, p=0.13). For latanoprost, baseline (pm-dosed) IOP was 17.7±0.5 mmHg; there was also no change with am-dosing (18.2±0.5 mmHg, p=0.3). In the am-dosing crossover comparison, 24-hour post-dose IOP was significantly lower (p=0.000003) on travoprost (16.9±0.4 mmHg) compared to latanoprost (18.6±0.5 mmHg). With latanoprost, IOP significantly increased (+1.5±0.6 mmHg, p=0.03) when subjects who preferred pm-dosing were switched to am-dosing; IOP was unchanged (-0.4±0.7 mmHg, p=0.7) when subjects who preferred am-dosing were switch to am-dosing. With travoprost, there was no significant change in IOP with am-dosing regardless of whether subjects preferred am-dosing (-0.7±0.6 mmHg, p=0.3) or pm-dosing (-0.9±1.1 mmHg, p=0.5). Overall, 56% of patients preferred am-dosing.
Conclusions: Am-dosed travoprost is superior to am-dosed latanoprost by 1.7 mmHg at 24-hours post-dose. Patient dosing preference adversely affected am-dosing efficacy for latanoprost but not for travoprost.
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P312 A COMPARISON OF INTRA OCULAR PRESSURE REDUCTION BETWEEN TRAVOPROST AND TIMOLOL MALEATE IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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Background: Primary open angle glaucoma is the most common of all glaucoma disease incidence. Intraocular pressure elevation is an important risk factor in glaucomatous optic neuropathy. To control intraocular pressure elevation an effective intraocular pressure lowering drug with minimal side effect is needed.
Purpose: To compare the intra ocular pressure lowering effect of travoprost 0.004% eye drops with timolol maleat 0.5% eye drops in primary open angle glaucoma patients.
Methods: The study was performed in Cicendo Eye Hospital, Bandung, Indonesia, since June to December 2005. This is an open label randomized control clinical trial with repeated measurement with parallel single mask.
Design: Forty subjects were selected consecutively and divided into 2 groups. Travoprost 0.004% eye drops or timolol maleat 0.5% eye drops were given to the subjects. Follow up for the intraocular pressure was measured in the first day, first week, second week, fourth week and eighth week. Statistical analysis using two sample profile analysis to compare the decreasing intraocular pressure between two groups.
Results: The baseline intraocular pressure in the travoprost 0,004% group and the timolol maleat 0.5% group were 28.25 and 29.30 mmHg (p=0.519) respectively. In the first day observation the intraocular pressure in travoprost and the timolol group were 19.72 and 26.82 mmHg respectively ($p < 0.0001$), in the first week observation the intraocular pressure in travoprost and the timolol group were 17.65 and 24.93 mmHg ($p < 0.0001$), i, and in the eighth week observation the intraocular pressure travoprost and the timolol group were 13.75 and 20.75 mmHg respectively. In the travoprost group the intraocular pressure decreased were 8.40-14.16 mmHg in the first day until eighth

day, and in the timolol maleat 0,5% group the intraocular pressure decreased were 2.23-8.30 mmHg.
Conclusion: Travoprost 0.004% eye drops has a bigger lowering effect of IOP compared to timolol maleat 0.5% eye drops in primary open angle glaucoma patients.
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P313 PREVALENCE OF LASH PTOSIS IN GLAUCOMA PATIENTS RECIEVING PROSTAGLANDIN ANALOGS
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Purpose: To investigate the frequency of lash ptosis in patients receiving topical prostaglandin (PG) analogs.
Design: Cross-sectional study.
Participants and controls: One hundred and seven consecutive patients who have used topical PG analogs for at least 12 months and presented for routine follow-up visits were included in the study. Patients who had previous intraocular or eyelid surgery, and those that recieved systemic medical treatment known to effect eyelash growth were excluded.
Methods: Eyelash ptosis was defined as eyelashes pointing below horizontal axis that passes through the eyelid margin. Patients with probable or clear eyelash ptosis as decided by one of the examiners were photographed. The photographs were evaluated by three independent examiners, and the diagnosis of ptosis was established when two or more of the examiners agreed. Trichomegaly, dermatochalasis, and other associated eyelid malpositions were noted.
Main outcome measures: Frequency of lash ptosis.
Results: The average age of 58 male and 49 female patients was 65.2±12.2 years. Average duration of prostaglandin analog use was 3.6±1.5 years (range;1-5 years). Bilateral and unilateral administration of topical PG analogs were noted in 97% and 3% of the patients, respectively. Majority of the patients (86%) used topical latanaprost, while bimatoprost and travaprost were used by 7% each. No periorbital pigmentation was observed. Trichomegaly and heterochromia was noted in all unilateral PG analog users. One patient who was on unilateral latanaprost treatment for 18 months had bilateral eyelash ptosis (1%). She had apparent darker iris and longer eyelashes on the left side. Flattening of the upward eyelash curve was noted in 2 patients. None of these 3 patients were aware of these changes nor do they have complaints that could be attributed to them. Significant dermatochalasis that might lead to visual field defects were noted in 8% of the patients .
Conclusion: Lash ptosis is a rare entity among patients on topical PG analogs. Longer, thicker eyelashes secondary to use of topical PG analogs may be associated with eyelash ptosis, however, a causal relationship is hard to establish. Bilateral eyelash ptosis in a patient who was on unilateral PG analog argues against this theory. Long term, prospective studies are needed to clarify this issue.
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P314 EFFECT OF LATANOPROST AND TIMOLOL ON THE HISTOPATHOLOGY OF THE HUMAN CONJUNCTIVA
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Purpose: To determine the effect of the anti-glaucoma medications timolol and latanoprost on extracellular matrix organisation and expression of matrix metalloproteinases (MMPs) and their inhibitors (TIMPs) in the human conjunctiva.
Methods: After informed consent, conjunctival biopsies were obtained at the inferior fornix during routine cataract surgery from 20 patients with primary open-angle glaucoma, who had received a monotherapy either with 0.5% timolol (mean age 75±7 years) or latanoprost (mean age 74±10 years) for 15-21 months and from 10 cataract patients without glaucoma (mean age 76±6 years) serving as controls. Specimens were investigated by light microscopy, quantitative transmission electron microscopy using an automated image-processing system, and immunohistochemistry using antibodies against MMP-1, MMP-3, TIMP-2, TIMP-3, and CD68.
Results: The area occupied by collagen fibres was significantly decreased in latanoprost-treated conjunctival specimens as compared to timolol-treated eyes (31.8% versus 36.6%; $p<0.01$), but was not significantly different from control specimens (33.5%). The amount of amorphous material, probably representing proteoglycans, was increased in both

treated groups as compared to controls (30.9%; p<0.001), but the difference was less pronounced in latanoprost-treated specimens (38.1%) as compared to timolol-treated eyes (43.3%; p<0.001). Approximately 30-40% of the area measured appeared as optically clear spaces in control eyes, with a significant reduction in both treated groups; this reduction was significantly less in latanoprost-treated specimens (19.0%) compared with timolol-treated eyes (13.4%; p<0.001). A marked upregulation of MMP-1 and MMP-3 protein and moderately increased staining for TIMP-2 and TIMP-3 was found in epithelial cells and subepithelial stromal cells of latanoprost-treated conjunctival tissue, whereas a moderate infiltration with macrophages and inflammatory was observed in timolol-treated specimens.
Conclusions: Compared with timolol-treated eyes, latanoprost-treated conjunctival specimens showed a less dense stromal matrix and less pronounced inflammatory infiltration. The upregulation of MMP-1 and MMP-3 in latanoprost-treated eyes might explain the reduction of extracellular matrix accumulation in the conjunctival stroma. Therefore, latanoprost therapy might have a more favorable effect on the outcome of glaucoma filtering surgery.

P315 EFFICACY OF TIMOLOL XE, BRINZOLAMIDE AND BUNAZOSIN AS ADJUNCTIVE THERAPY OF LATANOPROST: A DRUG CEASE STUDY

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Purpose: To study hypotensive effect of timolol XE, brinzolamide and bunazosin in patients who were receiving latanoprost with cease of timolol XE, brinzolamide and bunazosin.
Design: A case-control study.
Participants: Forty-five patients with open angle glaucoma or ocular hypertension were studied. Fifteen patients receiving latanoprost and timolol XE (11 men and 4 women, 62.7 ± 11.3 years), 15 patients receiving latanoprost and brizolamide (7 men and 8 women, 67.8 ± 10.0 years), and 15 patients receiving latanoprost and bunazosin (9 men and 6 women, 70.6 ± 8.0 years) were enrolled.
Interventions: Timolol XE, brinzolamide, or bunazosin was ceased and, 4 weeks later, was re-administered.
Main outcome measures: A change of intraocular pressure.
Results: Mean intraocular pressure before and 4 weeks after cease of timolol XE, brinzolamide or bunazosin was 15.9 ± 1.7 mmHg and 17.3 ± 1.7 mmHg in the timolol XE group, 15.9 ± 1.5 mmHg and 18.0 ± 1.3 mmHg in the brinzolamide group, and 16.3 ± 1.3 mmHg and 17.4 ± 1.2 mmHg in the bunazosin group. A significant increase was found in all groups (timolol XE P = 0.0224; brinzolamide P = 0.0030; bunazosin P = 0.0228). Mean change of intraocular pressure by cease of the drug was +1.6 ± 0.9 mmHg (10.3 ± 6.3%) in the timolol XE group, +2.3 ± 0.7 mmHg (+14.7 ± 5.1%) in the brinzolamide group, and +1.1 ± 0.8 mmHg (+7.2 ± 5.6%) in the bunazosin group; A change in the brinzolamide group was significantly greater compared with timolol XE and bunazosin (P = 0.0244; P = 0.0001). Mean intraocular pressure 4 weeks after re-administration was 15.6 ± 1.6 mmHg in the timolol XE, 16.0 ± 1.5 mmHg in the brinzolamide group, and 16. 5 ± 1.2 mmHg in the bunazosin group; there was no significant difference between before cease and 4 weeks after re-administration in any group.
Conclusions: There was a significant increase of intraocular pressure by cease of timolol XE, brinzolamide and bunazosin. Hypotensive effect of brinzolamide as adjunctive therapy of latanoprost may be greater compared timolol XE and bunazosin.

P316 A CORRELATION OF CONJUNCTIVAL HYPEREMIA AND INTRAOCULAR PRESSURE-LOWERING EFFECT OF LATANOPROST

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Purpose: To study a correlation of conjunctival hyperemia and intraocular pressure-lowering effect of latanoprost.
Design: A cohort study.
Participants: A hundred fifteen patients (65 men and 50 women) with open angle glaucoma or ocular hypertension. Mean age was 61.0±14.9 years (25 to 87 years).
Interventions: Administration of latanoprost.
Main outcome measures: A change of conjunctival hyperemia at 3 days and a change of intraocular pressure at 3 months after the start of administration of latanoprost. Conjunctival hyperemia grades were defined as described by Stewart et al.
Results: Mean intraocular pressure before and 3 month after latanoprost administration was 22.8 ± 4.4 mmHg and 16.7 ± 3.1 mmHg (P < 0.0001). Mean conjunctival bulbar hyperemia before and 3 days after administration of latanoprost was 0.65 ± 0.51 and 1.47 ± 0.99 (P < 0.0001). Mean intraocular pressure was -0.5 ± 1.5 mmHg, -3.1 ± 1.8 mmHg, -4.9 ± 2.6 mmHg, -6.5 ± 2.4 mmHg, and -11.3 ± 2.8 mmHg in eyes with 0, 1, 2, 3 and 4 of conjunctival hyperemia grade at 3 days, respectively. Mean change of intraocular pressure was -1.2 ± 2.1 mmHg (-6.0 ± 9.7%) in eyes with no hyperemia grade change, -5.1 ± 4.9 mmHg (-18.3 ± 10.0%) in eyes with a hyperemia grade change of 1, -6.8 ± 3.2 mmHg (-28.6 ± 10.8%) in eyes with a change of 2, and -10.2 ± 3.5 mmHg (-41.5 ± 12.7%) in eyes with a change of 3 (P < 0.0001). There was a significant correlation between an intraocular pressure change and hyperemia grade change (r = 0.606, P = 0.0001).
Conclusions: A significant correlation was found between an intraocular pressure change and hyperemia grade change. This may be clinically valuable when treating glaucoma with prostaglandins.
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P317 EFFICIACY OF BIMATOPROST 0.03% AND TRAVOPROST 0.004% IN PATIENTS WITH OPEN ANGLE GLAUCOMA

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Purpose: Comparison of the efficacy of travoprost and bimatoprost for lowering of intraocular pressure (IOP) and of

the influence on the ocular pulse amplitude (OPA) in open angle glaucoma patients.
Design: Prospective, randomised, parallel-group clinical trial.
Participants: Forty eyes of 20 glaucoma patients.
Method: All glaucoma drugs were washed out completely, afterwards the patients (n=20) got travoprost on their one eye and bimatoprost on the other eye. The IOP measurements were performed on baseline, day one, day seven and day 28, at 9:00 h. During the baseline and day one IOP has been measured six times a day, at 9:00 h, 12:00 h, 15:00 h, 18:00 h, 21:00 h and 24:00 h. IOP was measured with Goldmann applanation tonometry (GAT) and dynamic contour tonometry (DCT). The OPA was measured with DCT. Informed consent was obtained.
Main outcome measures: IOP and OPA.
Results: We observed no significant difference in IOP-lowering effect between travoprost and bimatoprost in glaucoma patients (p≥0.176 GAT; p≥0.082 DCT, p≥0.17 opa). The average of IOP-lowering by bimatoprost was 4.15±1.97 (GAT) or 3.57±1.6 (DCT) mmHg and 5.35±1.37 (GAT) or 2.6±1.55 (DCT) mmHg on day 28 (p 0.176 GAT, p 0.082 DCT) by travoprost. OPA was reduced by both glaucoma drugs on all visits without significant difference (p 0.642 on day 28). The average of OPA-reduction was 0.81±0.42 by bimatoprost and 0.9±0.57 on day 28 by travoprost. In no case, the treatment had to be stopped due to side-effects.
Conclusions: Both bimatoprost and travoprost are effective first line glaucoma drugs. Furthermore, both drugs were well tolerated by the patients.
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P318 A BILATERAL COMPARISON OF GLAUCOMA MEDICAL THERAPY

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Purpose: Bimatoprost, travoprost, and latanoprost have all been demonstrated safe and effective for the treatment of glaucoma and ocular hypertension in clinical trials. Few of these studies have compared efficacy of these medications within the same patients, however, or evaluated patient preferences. The purpose of this study was to evaluate differences in efficacy and patient preference between prostamide/prostaglandin agents used in a real-world clinical setting.
Design: Prospective study.
Participants: Patients (n=55) with uncontrolled glaucoma or ocular hypertension.
Methods: Patients were randomized to receive bimatoprost, travoprost, or latanoprost in one eye and one of the remaining two drugs in the fellow eye. At follow up (typically 4 to 6 weeks later), physicians and patients discussed the intraocular pressure (IOP) findings and other aspects of their treatment, and patients stated their preference between the two drugs used.
Main outcome measures: IOP reduction and patient preference.
Results: A total of 55 patients with a mean age of 67 years participated in the study. Results were analyzed for patients who received bimatoprost in one eye and travoprost in the fellow eye (n = 50). Five patients who received latanoprost were excluded from the analysis because of the small sample size. The mean IOP reduction from baseline was 2.7 mmHg in bimatoprost-treated eyes compared with 1.6 mmHg in travoprost-treated eyes (p = .230). Patients chose bimatoprost over travoprost by a factor of 2.4 to 1. Of the 15 patients who volunteered a reason for their choice, 80% cited improved IOP reduction.
Conclusions: The majority of study patients preferred bimatoprost over travoprost after trials in each eye.
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P319 A UNIOCULAR SWITCH STUDY COMPARING THE EFFICACY AND SAFETY OF BIMATOPROST WITH LATANOPROST IN GLAUCOMA

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Objective: There are limited data on effectiveness of substituting anti-glaucoma monotherapies. This study compares safety and efficacy of switching patients from latanoprost to bimatoprost eye drops.
Design: Multicentre, open-label, randomised, uniocular switch study of patients with open angle glaucoma or ocular hypertension.
Participants: One hundred five patients randomised; 101

completed 12 weeks. A sample size of 100 patients provided 80% power to detect a difference of 1.5 mmHg in intraocular pressure (IOP) between treatments at 2-sided 5% significance level.
Methods: The study was conducted according to Ich/Declaration of Helsinki. Patients with bilateral IOP between 17-22 mmHg (inclusive) and meeting inclusion/exclusion criteria were randomised. Patients previously treated bilaterally with latanoprost 0.005% switched to bimatoprost 0.03% in the study eye for 12 weeks; latanoprost continued in the control eye. Optional bilateral treatment with bimatoprost up to 24 weeks was available. Bilateral IOP was measured by applanation tonometry. Adverse events, visual acuity, and biomicroscopy were recorded every visit.
Main outcome measures: Primary efficacy outcome was change in IOP from baseline to week 12. Effectiveness defined as mean decrease from baseline IOP of 1.5mmHg or more in study eye. Interim results presented are for 12-week analysis. Safety outcomes were adverse events, visual acuity, biomicroscopy.
Results: Mean IOP study eye: baseline (18.95 mmHg) vs week 12 (15.95 mmHg), difference 3.00 mmHg, p<0.0001 (95% CI,3.50 to2.49). Mean IOP control eye: baseline (18.94 mmHg) vs week 12 (17.31 mmHg), difference 1.63 mmHg, p<0.0001 (95%CI,2.07 to1.18). Difference in mean IOP between study and control eye: 1.36 mmHg, p<0.0001 (95% CI,1.85 to0.87). Week 12 results show a statistically and clinically significant IOP reduction with bimatoprost. No unexpected adverse events were reported, with similar results for biomicroscopy and visual acuity between groups.
Conclusions: Latanoprost and bimatoprost significantly reduced IOP at week 12. Bimatoprost shows additional benefit in IOP reduction compared to control treatment, beyond potential regression to mean IOP. Reduction in IOP achieved in eyes switched to bimatoprost, is considered clinically meaningful by the investigators.
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P320 COMPARISON OF THE STABILITY OF BIMATOPROST 0.03% AND LATANOPROST 0.005%: A PATIENT-USE STUDY
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Purpose: Latanoprost and bimatoprost have both been shown to effectively lower IOP. Several studies suggest, however, that latanoprost may degrade after the package is opened. The purpose of this study was to determine the effect of temperature and light on the degradation rate of bimatoprost and latanoprost in a patient-use setting.
Design: This was an open-label, laboratory evaluation of the relative stability of bimatoprost and latanoprost.
Participants: Patients presently using bimatoprost (n = 31) or latanoprost (n = 34) were identified at two clinical sites in Brazil.
Methods: Patients were instructed to use and store their drops as usual and return all used medication bottles between day 28 and day 34. The concentration of active drug remaining in the bottles was quantitated at an independent testing facility using high performance liquid chromatography (HPLC).
Main outcome measures: Concentration of active drug remaining in bottles.
Results: There was no significant between-group difference in the mean age of bottles on the test date (43.0 ± 3.4 days for bimatoprost bottles and 43.9 ± 2.8 days for latanoprost bottles, p = .072). The test results showed that bimatoprost bottles retained a significantly greater percentage of the labeled active drug concentration after patients completed their course of therapy compared with latanoprost bottles. The mean percentage of labeled drug concentration was 103.7% in the bimatoprost bottles compared with 88.1% in the latanoprost bottles (p < .001). One hundred percent (31/31) of the bimatoprost bottles contained ≥100% of the labeled drug concentration compared with 8.8% (3/34) of the latanoprost bottles.
Conclusion: This study showed that bimatoprost maintained a ³100% active drug concentration throughout the study period, but latanoprost did not. The latanoprost active drug concentration degraded over the course of normal patient use.
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P321 THE EFFECT OF BIMATOPROST DROPPED IN ONE EYE ON THE INTRAOCULAR PRESSURE OF THE OTHER EYE IN HEALTHY INDIVIDUALS
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Objective: To analyse the effect of Bimatoprost (0.3 mg/ml) dropped in one eye on the intraocular pressure (IOP) of the other eye following systemic circulation, and to emphasize the importance of monitoring the unmedicated, healthy eye in case of one-sided glaucoma.
Design: The intraocular pressures of 31 healthy subjects with a median age of 26.04 ± 7.31 (17-50 years of age) were measured by Goldmann applanation tonometer, and Bimatoprost (0.3 mg/ml) was dropped in the left eyes.
Participants: 31 healthy subjects with a median age of 26.04 ± 7.31 (17-50 years of age).
Methods: Intraocular pressures of the both eyes were mea-

sured prior to dropping medication, and at 1, 3 and 6-hour intervals following medication.
Main outcome measures: There is a statistically significant decrease of IOP at the end of the 6th hour in both the left eye which medicated with Bimatoprost and in the right eye which not received drop. (left eye p<0,021) (right eye p<0.01).
Results: At 0, 1, 3 and 6 hours, intraocular pressure of the the left eyes measured as 14,04±2,65, 12,59±2,40, 10,91±1,93 and 10,50±1,70 mmHg. At the end of the 6th hour, the decrease in IOP compare to the initial value was found as 4,23±2,18 mmHg. At 0, 1, 3 and 6 hours, intraocular pressure of the right eyes measured as 14,90±2,39, 13,80±2,26, 13,14±1,80 and 13,26±1,65 mmHg. The decrease in IOP compare to the initial value was found as 1,96±1,74 mmHg.
Conclusions: Bimatoprost dropped in one eye causes a significant decrease in the IOP of the other eye in healthy individuals. Patients diagnosed with one-sided glaucoma and taking prostaglandin or prostamid should be monitored with regard to a possible glaucoma in the other eye considering the possible loss of IOP in the unmedicated eye.
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P322 A RANDOMIZED POST-MARKETING EFFICACY AND SAFETY STUDY OF LATANOPROST (XALATAN®) COMPARED WITH 'USUAL CARE' OVER 36 MONTHS
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Purpose: To compare the IOP reducing effect of latanoprost monotherapy with that of 'usual care' over 36 months, i.e., comparing the time to treatment failure between the two treatment groups.
Design: This was a multinational (Sweden and Finland), multicenter, open-label, randomized, parallel group study comparing latanoprost 0.005% once daily vs. 'usual care' (defined as commercially available medical IOP-reducing therapy excluding latanoprost and other prostaglandin analogues).
Participants: Patients with glaucoma or ocular hypertension and needing a change in their present therapy were included (mean diurnal IOP ≥21 mm Hg). A total number of 328 patients were randomized, 162 were treated with latanoprost (Male/Female=60/102; mean (SD) age=66.0 (9.2) years) and 164 were treated according to 'usual care' (Male/Female=67/97; mean (SD) age=67.4 (9.5) years). Two of the randomized patients were excluded before receiving any treatment.
Methods: After randomization the patients were treated for up to 36 months and were evaluated after 1, 3, 6 12, 18, 24, 30 and 36 months. IOP assessment was performed at each visit. The patients were also evaluated with respect to safety and health care resource utilization.
Main outcome measures: The primary endpoint was the time to treatment failure. The proportion of patients with successful treatment outcome, i.e., no treatment failure, was examined at 12, 24, and 36 months. Serious adverse events during the time period from baseline to treatment failure were evaluated. Finally, data for health care resource utilization were collected and derived into total direct cost.
Results: The median time to treatment failure was 36 months in the latanoprost group and 12 months in the 'usual care' group, p<0.001 (Log-Rank test). The median total direct cost per patient was not higher for the latanoprost group compared to the 'usual care' group over 36 months. None of the serious adverse events was related to the study medication.
Conclusions: The IOP reducing effects of latanoprost (Xalatan®) are sustained over a long period of time, thereby making the long-term drift less pronounced.
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11.5.2. Medical treatment: Carbonic anhydrase inhibitors: Topical

P323 A COMPARISON OF THE EFFECTS OF DORZOLAMIDE/TIMOLOL FIXED COMBINATION VERSUS LATANOPROST ON INTRAOCULAR PRESSURE AND PULSATILE OCULAR BLOOD FLOW IN OCULAR HYPERTENSIVE AND GLAUCOMA PATIENTS
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Purpose: To evaluate the effects of dorzolamide/timolol fixed combination (d/t) compared to latanoprost on intraoc-

ular pressure (IOP) and pulsatile ocular blood flow (POBF) in ocular hypertensive (OHT) and glaucoma (POAG) patients.
Methods: Eighteen patients were randomized in an open-label, cross-over study. Intraocular pressure reduction was achieved by 12 weeks medical therapy with d/t twice daily or latanoprost 0.005% dosed once in the evening. During a 12-week run-in and a 4-week wash-out period between study arms, patients ceased use of all other glaucoma medications. Primary efficacy variables were IOP and POBF.
Results: There was no difference in baseline IOP and POBF parameters between the two study arms. Both d/t and latanoprost statistically significantly reduced IOP by 6.3 mmHg ($p < 0.0001$) and 7.7 mmHg ($p < 0.0001$) and increased pobf by 2.2 microl/min ($p = 0,023$) and 3.6 microl/min ($p = 0,001$), respectively. Repeated measures anova detected significant changes in pobf with treatment ($p = 0.0361$). Dorzolamide/timolol fixed combination statistically significantly increased pulse volume by 1,5 microl ($p = 0.0087$), while latanoprost therapy increased by 1,4 ($p = 0.2407$).
Conclusions: Both drugs had similar effects in terms of IOP reduction and significantly increased pulse volume. Latanoprost statistically increased pobf in comparison to d/t. Further studies are necessary to establish whether the enhancement of choroidal blood flow can prevent glaucoma progression.

11.7. Medical treatment: Treatment of bloodflow

P324 THE EFFECTS OF TAFLUPROST, LATANOPROST AND TRAVOPROST ON OPTIC NERVE HEAD BLOOD CIRCULATION IN RABBITS

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Purpose: Tafluprost is a new-generation prostanoid FP-receptor agonist, which is a potent ocular hypotensive agent. Recently it has been reported that prostanoid FP-receptor agonists increase ocular blood circulation besides their ocular hypotensive effects. The purpose of this study was to evaluate the effects of tafluprost on optic nerve head (ONH) circulation in rabbits and compare it with that of other FP-receptor agonists, latanoprost and travoprost.
Design: Experimental study.
Methods: Male Dutch rabbits housed under a 12-hour light-dark cycle were used in this study. A quantitative index of blood velocity, squared blur rate (SBR), was determined with the laser speckle method 3, 5. Fifty µl of 0.0015% tafluprost (n=10), 0.005% latanoprost (Xalatan®) (n=10) or 0.004% travoprost (Travatan') (n=10) were topically administrated into the left eye once daily for 28 days. Measurement of the ONH blood velocity was performed in the same area in each animal during the experiment.
Main outcome measures: The change of onh blood velocity was calculated as the percent changes of their SBR values from the day before treatment.
Results: The trough SBR value of tafluprost on day 14 and day 28 was increased to 108.7 ± 4.4% and 111.9 ± 3.9% compared with the values before administration. The trough SBR values of latanoprost and travoprost on day 28 were increased to 107.2 ± 4.3% and 106.7 ± 3.5% compared with the values before administration. Sixty minutes after administration on day 14 and day 28, SBR value of tafluprost increased to 110.3 ± 3.4 and 116.1 ± 3.5% compared with the value before administration, respectively. Sixty minutes after administration on day 28, SBR values of latanoprost and travoprost increased to 106.1 ± 3.0% and 104.2 ± 3.7% compared with the values before administration, respectively.
Conclusions: Topical administrations of tafluprost and other FP-receptor agonists stably increase the ONH blood velocity in rabbits. The magnitude of increase in ONH blood velocity produced by tafluprost is greater than that of other FP-receptor agonists, latanoprost or travoprost.
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11.8. Medical treatment: Neuroprotection

P325 EVALUATION OF THE NEUROPROTECTIVE EFFECT OF ALPHA-TOCOPHEROL ON RETINA AGAINST GLAUCOMATOUS DAMAGE WITH COLOR DOPPLER, CENTRAL AND MACULAR VISUAL FIELDS

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Purpose: Glaucoma is an optic neuropathy. Damage in macular sensitivity precedes nevre fiber loss. Specific effects on intracellular pathways that were not mimicked by closest isomers and discovery of complex molecules that control its metabolism show that, alpha-tocopherol functions beyond an antioxidant. It is also a retinal vasoregulator via a pathway particular for glaucoma, protein kinase c.
Design: Randomized clinical trial.
Participants: Sixty glaucomatous eyes were divided into 3 groups.
Intervention: While group a-patients were receiving no tocopherol, group b- and c-patients were given 300 and 600 mgs/day of oral alpha-tocopherol, respectively.
Main outcome measures: Final blood tocopherol levels were confirmed with HPLC. Humphrey macular (8 eyes from each group), central visual fields and ophthalmic, posterior ciliary artery Doppler ultrasonography have been performed in the beginning 6 and 12 months of the study. Data were analysed with Mann-Whitney u test.
Results: Compared with group a, reductions in 6th month

ophthalmic artery differences of pulsatilty indexes in group b and 6th, 12th months posterior ciliary artery differences of resistivity indexes in group c were statistically significant. Though differences of mean deviations with central visual fields in groups b and c were very significantly lower than those of group a, no significant difference was found in macular visual fields.
Conclusions: Doppler findings in group a were consistent with the literature and found to be prevented in other groups. More dramatic central visual field loss preventative effects can be partially attributed to the use of alpha-tocopherol instead of synthetic preperates used in literature. In this study, the vasoregulator and neuroprotective effects of alpha-tocopherolmainly in retinal nerve fibers, have been clinically demonstrated. In the pathogenesis and treatment of glaucoma, alpha-tocopherol merits a concern beyond other antioxidants.
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P326 THE STUDY OF NOGO-66 VACCINATION FOR NEUROPROTECTION IN CHRONIC HIGH IOP GLAUCOMA OF SD RATS

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Objective: Glaucoma is the second leading cause of blindness in the world. It has been proved that enhancement protective autoimmunity can prevent neuron loss and disease progression. Nogo-66 receptor by ligand binding nogo-66 mediating to inhibit the cns survival or outgrowth. We suggest that it may be a good strategy to depress the inhibitory action of nogo by blocking nogo-66.
Design: We designed the study to investigate the effect of nogo-66 protein vaccine on promoting RGCS survival rate and preserving function of retinal neurons in chronic high IOP of sd rats by fluorogold, toluidine blue and flash visual evoked potential(F-VEP).
Participants and control: Adult Sprague-Dawley rats (8-10 weeks old, 200-220 g) were selected. Group I (n=6): the rats with a laser-induced in IOP were immunized by nogo-66 protein vaccine. Group II (n=6): the rats with a laser-induced in IOP were not immunized. Group III (n=6): the normal rats were as a control.
Methods: An increase in IOP was achieved in the eyes of deeply anesthetized rats by using a diode laser at 532 nm. Group I rats with a laser-induced in IOP were immunized, at before 7 days, after 7 days and immediately after the laser session respectively, with nogo-66 protein (165μg, nogo-66 protein were supplied by our laboratory) were emulsified in complete Freund's adjuvant (CFA) or incomplete Freund's adjuvant (IFA). A total volume of 300 μl was injected subcutaneously into each rat at the voix pedis and back. In 2 or 6 months, RGCS survival rates were evaluated after fluorescent gold labeling, optic nerval sheath were observed by toluidine blue staining, and function of retinal neurons were evaluated by F-VEP.
Main outcome measures: Iop was measured with a handheld tonometer (tono-penxl) in rats. RGCS in corresponding zones of retina were counted in images taken with a 40-objective subtending an area. The areas of the optic nerve sheath in cross section were counted in images taken with a 20-objective. The standard of F-VEP referred to ISCEV. All counting were analysed by spot software (diagnostic instruments. Ins, version 3.5.2). Statistical analyses (±sd) were performed by SPSS13.0 software.
Results: Fluorogold labelling RGCS proved that the RGCS survival in group I was 88.92%±1.67%, raised 8.21%±4.14% compared with it in group II in 2 months post laser (n=6, $p<0.05$), and it was 86.08%±1.57%, raised 9.13%±5.48% compared with it in group II in 6 months (n=6, $p<0.05$) (figure 1). Toluidine blue staining showed that myelinated optic nerve fiber survival in group I was significantly higher compared with it in group II in 6 month (n=6, $p<0.05$)(figure 2). F-VEP results showed that the ap1 mean of group I became raised and the lp1 mean recovered compared with them of group II in 2 or 6 month (n=6, $p<0.05$)(figure 3).
Conclusions: The evidence suggests that nogo-66 vaccine is effective in preventing the death of neurons and preserving the function of retinal neuron. The vaccination may have therapeutic benefit for glaucoma.

P327 PROTECTIVE EFFECT OF TAFLUPROST ON GLUTAMATE-INDUCED CYTOTOXICITY

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Purpose: Tafluprost is a new-generation prostanoid FP-receptor agonist, which is a potent ocular hypotensive agent. Glaucoma is a progressive optic neuropathy characterized by the loss of visual field, resulting from neuronal cell death in the retina. Latanoprost, FP agonist widely used for the treatment of glaucoma as an ocular hypotensive agent, is reported to have neuroprotective effects, and other FP agonists are also expected to have the neuronal cell death preventing effects. The purpose of this study is to investigate the protective effect of tafluprost on the l-glutamate-induced cytotoxicity using primary cultures obtained from the fetal rat retina.
Design: Experimental study.
Methods: Primary culture cells were obtained from fetal rat retina. Cytotoxicity in retinal cells was induced by exposure to 1 mm l-glutamate for 10 minutes. Tafluprost acid form, latanoprost acid form, or travoprost acid form in 0.1-100 nm were treated to retinal cells before, during, and after the glutamate treatment. Ten microm of MK-801 was treated during the glutamate treatment. Cell viability was measured with a trypan blue staining assay. Glutamate-induced intracellular calcium ion influx was measured by loading of fura-2 am.
Results: Exposure to glutamate reduced the cell viability

to 58-68 % compared to the control group. MK-801, NMDA receptor antagonist, recovered 66.1 ± 6.5% of cell death. Tafluprost acid form, which is the biologically active metabolite of tafluprost, significantly prevented glutamate-induced cytotoxicity in a concentration-dependent manner in more than 10 nm, and recovered 51.7 ± 7.9% of cell death in 100 nm. Travoprost acid form, and latanoprost acid form in 100 nm also recovered 25.0 ± 8.5% or 16.8 ± 7.6% of cell death respectively, but it was not significant. Glutamate treatment immediately induced intracellular calcium ion influx in retinal cells. When cells were treated with tafluprost acid form, glutamate did not or little induce intracellular calcium influx.

Conclusions: Tafluprost showed the protective effect on glutamate-induced cytotoxicity in retinal cells, and one of the estimated mechanisms is the inhibition of calcium influx. Tafluprost should be therefore an effective approach to glaucoma therapy; it lowers the intraocular pressure, and prevents retinal cell damage.

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P328 TOPICAL COQ10 IS NEUROPROTECTIVE IN EXPERIMENTAL GLAUCOMA

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Purpose: Coq10 is a molecule that has been shown to have neuroprotective activity. It is a free radical scavenger being a cofactor of the electron transport chain where it transfers electrons from complexes i and ii to complex iii. In this study, we investigate the effects of topical coq10 using glaucoma-related in vivo rat models of retinal ganglion cell (RGC) apoptosis.

Design: Two different rat models of RGC apoptosis were studied. To investigate dose and administration effects: rat eyes injected with intravitreal staurosporine (SSP), rat with surgical induction of elevated IOP.

Participants: A) Dark agouti (DA) rat eyes with SSP underwent the following treatments: n=18/group; x1 or x2 topical coq10 (Visufarma SRL, Italy) 0.1%, x1 coq10 0.05%, or carrier or saline control) given either 4 hours or 30 minutes before or 1 hour after SSP. Administration under general anaesthesia. B) The most effective dosing regimens were then assessed and compared to control in a chronic ocular hypertension (OHT) rat model with darc imaging at 3 weeks after IOP elevation (n=10), and histological analysis thereafter.

Methods: Eyes were imaged in vivo using DARC (detection of apoptosing retinal cells), and results confirmed histologically.

Main outcome measure: DARC count.

Results: Coq10 0.1% significantly reduced RGC apoptosis compared to coq10 0.05% ($p<0.05$) and carrier ($p<0.05$) in the SSP model. No benefit was exhibited by increasing the dose to x2. The most effective timing of the treatment application was at 1 hour after SSP administration. Coq10 0.1% administered 1 hour after IOP elevation in the experimental glaucoma study was found to significantly inhibit the development of RGC apoptosis in vivo at 3 weeks in the OHT model ($p<0.05$), with efficacy demonstrated both in vivo and histologically.

Conclusions: These results show that coq10 0.1% has a neuroprotective effect not only on SSP-induced but also OHT-induced RGC apoptosis in vivo. Coq10 has been safely used in patients with parkinson's disease and als as an oral medication. Perhaps the most exciting finding in this study is the demonstration of its efficacy as an eyedrop formulation. We believe coq10 represents a promising neuroprotective topical treatment in glaucoma with clinical trials planned shortly.

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P329 NEUROPROTECTIVE EFFECT OF TOPICALLY APPLIED BRIMONIDINE TARTRATE 0.2 % IN ENDOTHELIN-1 INDUCED OPTIC NERVE ISCHEMIA MODEL

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Objective: To investigate the neuroprotective effects of topically applied brimonidine tartrate 0.2 % (BMD), an α2-receptor agonist, on retinal ganglion cell (RGC) layer and inner nuclear layer (INL) of rabbit retina in endothelin-1 (ET-1) induced optic nerve (ON) ischemia model.

Design: Experimental study.

Participants: Thirty-two eyes of sixteen New Zealand albino rabbits were included.

Methods: Osmotic minipumps were surgically implanted in one eye of 16 New Zealand albino rabbits to deliver ET-1 at the constant rate of 0.5 µl/h for 2 weeks. Eyes were divided into 4 groups. ET-1 was given with and without topical BMD therapy to the eyes in group 3 and group 1, respectively. Group 2 and 4 were the fellow eyes of the rabbits and taken as controls. Rabbits were sacrificed at the 14th day of infusion.

Main outcome measures: Morphological alterations, total cell number and apoptosis rate in INL and RGC layer of

retina were assessed by histopathologic analysis to determine the survival of the cells in INL and RGC layers.
Results: ET-1 led to severe reduction of cells in both RGC layer and INL in group 1 ($p<0.05$). In group 3, total cell number and apoptosis rate in RGC layer were comparable with control group (group 4) whereas former was found to be higher and latter was found to be lower than those of group 1, respectively. However, total cell number in INL was found to be decreased in group 3 compared to those of group 4 despite topical BMD therapy ($p<0.05$).
Conclusions: Topically applied BMD 0.2 %, seems to be a neuroprotective and antiapoptotic in ET-1 induced on ischemia model especially for RGCS. BMD might be used as an adjuvant agent for its neuroprotective effects in hypoxic ischemic conditions such as diabetic retinopathy, normotensive glaucoma, anterior ischemic optic neuropathy and other retinal vascular occlusive conditions which require further investigations.
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P330 BLOCK OF NMDA-INDUCED ACTIVITY IN RETINAL GANGLION CELLS BY MEMANTINE
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Purpose: Excessive activity of nmda-type glutamatergic membrane channels has been implicated as a mechanism for neuronal injury in a wide range of cns disease including glaucoma. Memantine, a use-dependent NMDA-type channel blocker, has recently been approved in the US. For treatment of Alzheimer's dementia and is also being evaluated in a multicenter clinical trial for efficacy to prevent glaucomatous vision loss. The experiments summarized here were designed to characterize any effect of memantine on normal retinal light signaling as well as its action to reverse or block NMDA-induced changes in the activity of retinal ganglion cells (RGCS).
Design: This work represents a pharmacological investigation using an experimental model of glutamatergic excitotoxic insult to RGCS. Experiments were performed on retinas isolated from 21 naive eyes obtained from pigmented rabbits.
Methods: Simultaneous recordings of the electroretinogram (ERG) and single-unit RGC activity were obtained using standard electrophysiological methods. The retina was mounted in a chamber inside a light-tight faraday cage, perfused continuously with physiological saline, and maintained at 350 c. Light responses were elicited with a blue-green led (λpeak = 505 nm).
Experimental measures: ERG responses were quantified by measuring the kinetics and amplitude of the b-wave. RGC spiking activity was quantified by measuring the amplitude and timing of light responses. Tonic RGC activity was also recorded as the level of action potential (AP) firing obtained in the absence of light stimulation.
Results: Most RGCS tested were sensitive to application of NMDA at concentrations ranging from 30 nm to 100 nm. For these cells, application of NMDA was followed by an increase in the tonic level of action potential frequency. In some cells, application of NMDA was associated with a decrease in ap amplitude and complete block of the light response. Washout of NMDA was followed by a rapid return of RGC activity to control levels. Application of memantine (1-30 nm) in combination with NMDA resulted in a dose-dependent block of NMDA-induced AP activity. Application of memantine alone had little or no effect on the ERG b-wave, but was associated with a dose-dependent delay in RGC off responses.
Conclusions: Application of memantine is associated with a block of NMDA-induced increase in RGC AP activity at a concentration that has little or no effect on normal retinal light signaling.
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Hare WA, Woldemussie E, Lai RK, et al. Efficacy and safety of memantine treatment for reduction of changes associated with experimental glaucoma in monkey, I: functional measures. IOVS 2004;45:2625-2639. 5. Hare WA, Woldemussie E, Weinreb RW, et al. Efficacy and safety of memantine treatment for reduction of changes associated with experimental glaucoma in monkey, II: structural measures. IOVS 2004;45:2640-2651.

11.14. Medical treatment: Investigational drugs; pharmacological experiments

P331 DIURNAL CURVE AND IOP LOWERING EFFICACY OF TRAVOPROST
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Objective: To evaluate the safety, intraocular pressure-lowering efficacy and diurnal curve of travoprost 0.004% and timolol 0.5% in patients with primary open-angle glaucoma and ocular hypertension.
Design: Three-months, randomized, controlled, prospective clinical study.
Participants: Sixty patients (120 eyes) with primary open-angle glaucoma or ocular hypertension.

Methods: Eligible patients required to have 22 to 36 mmHg in at least one eye at 8 am intraocular pressure measurements, at three eligibility visits. The first group of 30 patients received timolol 0.5% twice a day. The second group of 30 patients received travoprost 0.004% once daily in the evening.
Main outcome measures: Mean diurnal IOP at 8 am, 10 am and 4 pm at baseline and follow-up visits.
Results: Both drugs reduced IOP significantly at all follow-up and times of day ($p<0.001$). Travoprost was significantly superior to timolol in lowering IOP at 8 of 12 visits. The mean diurnal IOP was 19.17 mmHg for the timolol group and 17.57 mmHg for the travoprost group. The mean IOP reduction from baseline was significantly ($p<0.001$) greater with travoprost (-6.06 to8.03 mmHg) than with timolol (-4.20 to6.21 mmHg). The most frequent related adverse events were dry eye sensation in the timolol group and conjunctival hyperemia and foreign body sensation in the travoprost group. Local tolerance was better in the timolol group compared with patients receiving travoprost.
Conclusions: Travoprost 0.004% dosed once daily in the evening was statistically superior in lowering IOP than timolol 0.5% dosed twice daily. An IOP reduction by up to 2.43 mmHg greater than timolol was found in the travoprost pooled data group. Both drugs were well tolerated and safe for use in the studied patients' population.
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P332 COMPARISON OF IOP-LOWERING EFFECT OF TAFLUPROST AND A FIXED COMBINATION OF TIMOLOL / DORZOLAMIDE IN OCULAR NORMOTENSIVE MONKEYS

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Introduction: Tafluprost, a synthesized PGF2- alpha derivative, is a new-generation prostanoid FP-receptor agonist for the treatment of glaucoma. Its chemical structure differs from that of the other available prostanoids: instead of a hydroxyl group at the carbon-15 position it has two fluorine atoms. It has been believed that the 15-hydroxy group in the PGF2-alpha molecule is essential for biological activity, since dehydrogenation of the hydroxyl group leads to a marked loss of biological activity. Tafluprost is the first prostanoid FP-receptor agonist to defy this commonly held belief. In early pharmacological study, tafluprost has exhibited more potent iop-reducing effects than latanoprost in ocular normotensive monkeys. Results from phase i and ii clinical trials indicated that tafluprost had a stronger IOP-lowering effect than latanoprost. These finding expected that efficacy of tafluprost monotherapy in NTG may be even equal to several concomitant or combination therapy.
Purpose: To compare the efficacy of tafluprost monotherapy and a fixed combination therapy in ocular normotensive monkeys.
Design: Experimental study.
Methods: Male twenty-four cynomolgus monkeys which had been trained to accept instillation of eye drops and IOP measurement in conscious were used. Tafluprost 0.0015% (once a day), a fixed combination of timolol/dorzolamide (Cosopt®, twice a day) or saline (twice a day) was topically applied to one eye for 14 days. IOP measurements were performed 0, 2, 4, 6, and 8 hour after topical application of test solutions on day 1, day 7 and day 14.
Main outcome measures: Maximal IOP reduction, trough time-point IOP reduction.
Results: Both tafluprost and a fixed combination of timolol / dorzolamide showed significantly IOP-reducing effect in ocular normotensive monkeys. The maximal reductions in IOP achieved by tafluprost and a fixed combination of timolol / dorzolamide were 3.9 ± 0.4 mmHg and 2.6 ± 0.5 mmHg on day 1, 4.5 ± 0.5 mmHg and 2.3 ± 0.5 mmHg on day 7, and 4.7 ± 0.5 mmHg and 2.2 ± 0.5 mmHg on day 14, respectively. Although a fixed combination of timolol / dorzolamide did not reduce IOP at the trough time-point, tafluprost did significantly reduce trough IOP compared with saline group on day 14.
Conclusions: Tafluprost revealed a potent IOP-reducing effect compared with a fixed combination of timolol and dorzolamide in ocular normotensive monkey eyes. Tafluprost monotherapy may be an effective medication for patients with glaucoma especially for NTG patients.
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P333 VASODILATIVE EFFECTS OF TAFLUPROST, A NEW PROSTAGLANDIN F2-DERIVATIVE, ON RABBIT CILIARY ARTERY

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Purpose: Tafluprost is a new prostaglandin F2αlfa derivative developed as an ocular hypotensive drug in Japan. To evaluate the pharmacological effect of this drug on vascular smooth muscle, we have investigated its effects using 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. The effects of tafluprost and other agents were investigated using isometric tension recording methods. Fluorescence photometry was also used to monitor the change of intracellular free calcium concentration ([ca2+]i).
Results: Tafluprost induced a concentration-dependent

relaxation in rabbit ciliary arteries pre-contracted with a high-k solution. The relaxation was unchanged by pretreatment with l-name (100µm), indomethacin (10µm), ouabain (100µm), or denudation of the vascular endothelium. Tafluprost (30µm) did not have effect on the amplitude of contraction induced by histamine (1 µm) in ca2+-free solution. In fluorescence photometry studies, tafluprost (30 µm) did not decrease the amplitude of [ca2+]i induced by histamine (10 µm) in ca2+-free solution, but completely suppressed the [ca2+]i increase induced by high-k solution.
Conclusions: Tafluprost relaxes isolated rabbit ciliary artery pre-contracted with a high-k solution. This effect was, at least in part, due to inhibition of ca2+ entry from the extracellular space.
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P334 TARGETING ALZHEIMER PROTEIN BETA AMYLOID FOR TREATMENT IN GLAUCOMA
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Purpose: Retinal ganglion cell (RGC) apoptosis is an early marker of glaucoma. We have previously demonstrated that amyloid-ß (Aß) is strongly implicated in the development of RGC apoptosis in glaucoma. In this study, we have investigated the effects of different approaches to targeting Aß in experimental glaucoma.
Design: Experimental rat model of chronic ocular hypertension (OHT).
Participants and controls: OHT rats were treated with Aß antibody (0.5 mg/ml, n=5), Congo red (1.46 mg/ml, n=5), ß-secretase inhibitor ii (10 µg/ml, n=5), and IGG1k purified protein (null antibody, 0.5 mg/ml, n=5) as control.
Methods: Rat model of OHT was made as previously described. Animals were treated at the time of surgical IOP elevation (0 weeks), with the treatments targeting Aß (all 5µl intravitreal injections) itemized above.
Main outcome measures: All treated animals were imaged in vivo with our recently established DARC (detection of apoptotic retinal cells) imaging method at baseline, 3, 8 and 16 weeks and then sacrificed for histology.
Results: All treatments targeting Aß showed reduced RGC apoptosis compared to control OHT at 3 weeks. Aß antibody resulted in a significant reduction of RGC apoptosis at 3 ($p<0.05$), 8 ($p<0.01$), and 16 ($p<0.01$) weeks after IOP elevation. Congo red showed significant reduction of RGC apoptosis at 3 ($p<0.05$) but not 8 and 16 weeks. ß-secretase inhibitor showed a modest reduction of RGC apoptosis at 3 weeks, but this did not reach significance compared to control, with no significant effects at 8 and 16 weeks after IOP elevation.
Conclusion: Our results strongly suggest amyloid-ß to be involved in the experimental glaucoma. We demonstrate for the first time that targeting Aß formation and aggregation may be a potential approach in the treatment of glaucoma. Furthermore, a single injection of the Aß antibody produced prolonged and significant effects. We believe that Aß antibody represents an exciting novel therapeutic strategy in glaucomatous disease.
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P335 3-MONTH SAFETY AND IOP-LOWERING EFFICACY OF THE CORTISENE, ANECORTAVE ACETATE, IN PATIENTS WITH OPEN-ANGLE GLAUCOMA (OAG)
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POSTER WITHDRAWN

P336 ASSESSMENT OF THE IOP-LOWERING EFFECT OF CALCIUM ANTAGONIST FLUNARIZINE EYE DROPS
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Purpose: Pharmacodynamic study to assess the iop-lowering effect and tolerability of flunarizine (a calcium channel blocking molecule) following single instillation.
Design: Double-blind, randomised, placebo-controlled, phase II, cross-over trial.
Methods: Eleven patients diagnosed with primary open angle glaucoma (POAG), pseudoexfoliative glaucoma or ocular hypertension, were included. Each patient served as his own control, since only the target eye (IOP ≥ 22 mmHg) was treated. A vehicle was used as the placebo. One drop of 0.05% flunarizine was applied in the target eye. Patients were followed-up during 6 hours (0, 15, 30 and 60 minutes, 2, 3, 4 and 6 hours) for vital signs, slit lamp examination, corneal fluorescein staining and IOP.
Main outcome measures: IOP change from baseline.
Results: During the 6 hours following single instillation, flunarizine induced a significant decrease of IOP (-13.17 mmHg.h, $p = 0.01$ versus baseline). The same trend was observed in the placebo (vehicle) group (-6.75 mmHg.h, $p = 0.45$), although the decrease was not significant. However, no significant difference ($p > 0.05$) in the decrease of IOP was found between flunarizine and placebo-treated eyes given the low number of patients. A single instillation of 0.05% flunarizine did not affect systolic and dia-

stolic blood pressures and pulse rate. No difference (p > 0.05) was found between flunarizine and placebo-treated eyes for the tolerability parameters: slit lamp examination, corneal staining with fluorescein. Both flunarizine and placebo eye drops showed good patient comfort.
Conclusions: This pharmacodynamic study shows that both vehicle and 0.05% flunarizine are well tolerated. Flunarizine is potentially promising product for the treatment of glaucoma. A longer follow-up of patients and different concentrations of flunarizine should be investigated, as well as potential neuroprotective effects.
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11.16. Medical treatment: Vehicles, delivery systems, pharmacokinetics, formulation

P337 RELEASE KINETICS AND ANTIPROLIFERATIVE POTENTIAL OF SODIUM HYALURONATE GEL (HEALON AND HEALON 5) AS A DRUG RELEASE SYSTEM FOR HYDROPHILIC STEROID FORMULATION IN GLAUCOMA SURGERY

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Purpose: To evaluate the in vitro release kinetics, the safety and the antiproliferative potential of a concentrated hydrophilic steroid formulation from commercially available sodium hyaluronate gels (HA) used as a slow release system for glaucoma filtration surgery.
Design: Experimental study.
Methods: Dexamethasone and healon (HA) or healon 5 (HA5) were mixed preparing HA formulations containing dexamethasone in concentrations from 4 mg/ml to 20 mg/ml (7.7 mm to 38.7 mm).
Main outcome measures: Release into BSS or PBS was measured spectrophotometrically over 2 to 6 days. The release of the steroid was plotted as function of the square root of time. To assess the antiproliferative potential of HA containing dexamethasone monolayer cultures of human retinal pigment epithelium (ARPE19) and human tenon fibroblast (HTFB) cells were used. Cellular proliferative activity was monitored by BRDU-incorporation into cellular DNA. For cytotoxicity assays ARPE19 and HTFB cells were grown to confluence and then cultured in a serum-deficient medium to ensure a static milieu. MTT assay after one day and life/dead cell-mediated cytotoxicity kit after 6 days of incubation were used to exclude cytotoxicity.
Results: The release kinetics from HA and HA5 were identical, steady state was achieved after 48 hours in the non-cumulative measurements. Fifty percent of the drug was released by 6 hours into BSS and PBS. The release rate slowed down after 24 hours. No kinetic differences were seen between the higher and the lower concentrations of dexamethasone. The release plotted as a function of the square root of time was consistent with a largely diffusion-controlled release system. Dexamethasone-loaded HA showed a significant antiproliferative effect on ARPE19 and HTFB cells at dexamthasone concentrations of 0.9 mm or higher.
Conclusions: Dexamethasone-loaded HA shows extended release of steroid over up to 2 days in concentrations high enough to inhibit proliferation of HTFB and RPE cells. Thus this formulation may be a valuable, easy to prepare adjunct for sustained antiproliferative drug effect in glaucoma surgery or other ophthalmic procedures.
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11.17. Medical treatment: Cooperation with medical therapy, *e.g.*, persistency, compliance, adherence

P338 MAIN FACTORS FOR INADEQUATE COMPLIANCE WITH MEDICAL TREATMENT OF GLAUCOMA

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Purpose: To identify and describe the factors which may cause inadequate compliance with medical treatment of glaucoma.
Design: A questionnaire was designed to determine the

main factors for inadequate compliance with medical treatment of glaucoma.
Participants: This study was based on 328 cases with glaucoma.
Methods: The subjects were interviewed and the data about sex, age, duration of glaucoma, education, employment, family history of glaucoma, the type and dose frequency of anti-glaucoma medications, existence of side effects of therapy, usage of medications for other systemic diseases and their information about glaucoma, were correlated with their compliance with medical treatment of glaucoma. They were also asked if they would prefer trabeculectomy to medical treatment. Chi-square test, independent samples t-test and logistic regression analysis were used for statistical analysis of the datas.
Main outcome measures: Main factors for compliance with glaucoma treatment.
Results: Compliers were more likely: to be young, to have higher level of education, family history of glaucoma, adequate information about the progres of glaucoma, longer duration of glaucoma, not to use systemic medications for any other systemic diseases and to use only one anti-glaucoma drop once or twice daily.
Conclusion: Age, duration of glaucoma, level of education, level of information about glaucoma, family history of glaucoma, chronic usage of systemic medications and number and dose frequency of anti-glaucoma treatment are main factors for compliance with glaucoma treatment.
References:
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P339 A RANDOMIZED POST-MARKETING EFFICACY AND SAFETY STUDY OF XALATAN COMPARED WITH 'USUAL CARE' OVER 36 MONTHS
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POSTER WITHDRAWN

P340 USE OF XALEASE® AS AN ADJUNCTIVE DEVICE FOR IMPROVING DRUG DELIVERY
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Objective: The objective of this study was to enhance drug delivery of Xalatan' or Xalacom' through the use of a hand-held drop administrator, Xal-ease', designed for improving patient compliance through better instillation of aforesaid medications.
Design: Prospective, non-randomized clinical 6-month trial.
Participants: Eighty patients were recruited who had already used these medications for 3 months and were stable with this treatment alone.
Methods: Patients counted the number of drops used and the number of days of instillation. After informed consent, they were shown how to use this drop administrator and practiced its use under medical supervision. Patients were seen at 1, 2 3 and 4 months.
Main outcome measures: Days of use as well as number of drops were counted. Secondary measures were patient comfort with the hand-held drug administrator.
Results: The average use of Xalatan 'drops was 59.85, equivalent to 29.93 days per bottle, before use of xal-ease', and after using it, the average at 3 months was 78.37 drops, or 39.22 days, resulting in a 31% increase in days and drops, $p<0.0001$. The improvement with Xalacom' was similar, 28.5% increase in days of use, and 27.42% increase in drops delivered, $p<0.0001$.
Conclusions: Patients were satisfied with the facility of use of this administrator, and especially with the improvement of drug delivery, which allowed them to get approximately 30% more drops per bottle, improving also cost of medication.
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P341 ARE GLAUCOMA PATIENTS RELIABLE IN MANAGING THEIR THERAPY?
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Purpose: To verify adherence to the simplest topical therapeutic regimen in glaucoma, and to compare it with self reported frequency of administration.
Methods: We selected consecutive bilateral openangle glaucoma patients on travoprost monotherapy coming for routine visits in our glacoma service, and gave them a iniaturized device (Travalert™), recording date, time and number of drop instillations. Patients were told that the device was meant to help them squeeze the bottle and tried it in front of us until a correct use was achieved. They were asked to bring the device back 4 weeks later, when we downloaded the device data and administered them a questionnaire about scholarity, family status, help in putting the drops, factors impairing correct self-instillation, adverse events, and a self-estimate of the number of missed doses. To minimize biases, 'Missed dose' was the total absence of recorded dosing for over 36 hours.

Results: Twenty-two patients were enrolled (mean age 61±13 years): 1 failed to return the device, the other 21 reported no problem in using it. 17/22 stated that they had administered 'all' the doses, whereas 2/22 declared they had missed the drop 'once or twice in a month': data analysis revealed that patients had missed 12.6% of the administrations. Among those who declared that they had always put their drops, one had a 58% missing rate, and 3 had missed over 33% of the doses. The 2 subjects who reported missing the drop 'once or twice' had only a 6% and 12% missing rate. In the 3 days before the control visit the missing rate was 9.5%. Patients with lower scholarity level had a slightly higher rate of missed drops, attaining 15%, compared to 11.5% in the subgroup with higher scholarity (n.s.). Five patients stated that were helped by another person in putting the drops, and these missed only 8% of the doses. ***Conclusions:*** 12.6% (range 0-58%) of the daily instillations of glaucoma monotherapy were missed. 19% of patients had a very poor adherence to therapy, with missing rates ranging from 33 to 58%. The patients' statements about their adherence to prescription were unreliable. Higher scholarity was associated with a slightly better compliance. Help by another person can improve adherence, which also tends to increase slightly in the days preceding a control visit.

P342 IS AN ELECTRONIC DEVICE (TRAVALERT™) AIMED AT FACILITATING THE USE OF TOPICAL PROSTAGLANDIN ANALOG MONOTHERAPY HELPFUL FOR GLAUCOMA PATIENTS?

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Purpose: To assess whether an electronic device (Travalert™) incorporating a drug bottle, a small leverage to squeeze it and an acoustic reminder, may help glaucoma patients in managing a prostaglandin analog qd monotherapy.
Methods: We selected consecutive bilateral open-angle glaucoma patients already on Travoprost monotherapy coming for routine visits in our glaucoma service. Subjects were given a device recording date, time and number of drop instillations. The alarm function was initially set to off. Patients were told that the device was meant to help them squeeze the bottle and put the drops in their eyes, and tried it in front of us until a correct employ was achieved. They were instructed to put the drop at 10 pm, and were asked to bring the device back in 4 weeks. At the interim visit we downloaded the data, activated the acoustic reminder, setting it on 10 pm, informed patients about this and asked them to use the device for further 4 weeks. At the final visit patients were administered a questionnaire to rate usefulness and liking of Travalert™. We also evaluated the percentage of doses administered at 10 pm ±30 min, and the percentage of missed doses in the two 4-week intervals.
Results: Twenty-two patients were enrolled and 18 of them completed the study (1 patient lost the device; 3 delayed the interim visit over 1 week), and were included in the analysis. Mean patients' age was 65±8 years. All subjects reported no problem in using the device and 16 (89%) stated that it made administration easier both by helping to squeeze the bottle and to get the drop in the eye, but 12 (66%) complained about not hearing the feeble alarm of the device. Overall, the number of doses administered at 10 pm ±30 min was only 27.5% and the activation of the acoustic reminder increased it to 32% (n.s.), but we observed a relevant improvement in administration timing in 39% of the patients, in whom the percentage of drops administered on time increased by up to 73%, and the percentage of missed doses fell by up to 22%.
Conclusions: Travalert™ is appreciated by glaucoma patients because it facilitates drop administration and 40% of the patients seem to benefit from the acoustic reminder.

P343 ADHERENCE AND DISEASE PERCEPTION AMONG PRIMARY OPEN ANGLE GLAUCOMA (POAG) PATIENTS

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Objective: Adherence to glaucoma medications is a public heath problem and an important issue for minimizing peripheral and central vision loss. Our study was undertaken to investigate patient-reported adherence in POAG patients.
Design: An in-depth interview was applied to assess the number of instillations of glaucoma eye drops versus instillated ones, prescribed for POAG treatment. The adherence was measured by the percentage of instillations accomplished in the last 3 days. The relationship between adherence and demographic data was assessed.
Participants: Quali-quantitative interview of 102 patients at glaucoma service, Ophthalmology Clinic, University of São Paulo, Brazil, was performed in September 2006.
Results: Data analysis did not show any positive correlation between age (p=0,1), educational level (p= 0,2), personal income (p=1,0) and adherence. 94% believe that they will become blind without any treatment. Although afraid of negative consequences, 43% of patients declared that consistently or sporadically forget to instillate the eye drops, whereas in the last 3 days, 68% of the patients were adherent (100%) to the proposed treatment and 32% presented a mean rate of adherence of 61.2±28.7. There was no significant difference between adherence and patients difficulties or problems to use eye drops (p=0.85). Positive correlation was observed between adhesion and difficulties to remember glaucoma medications (p= 0,02; or=4,32). Patients satisfied with their knowledge about the treatment presented better adherence (p= 0,03; or=6,42).
Conclusion: Qualitative data showed that information on disease and treatment is important for adherence, but patients' perception about their disease may also interfere. The knowledge of patients' perception may provide additional information related to glaucoma medication adherence.
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P344 ADHERENCE WITH ANTI-GLAUCOMA MEDICATION THERAPY IN SOUTH INDIA

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Aim: To determine the factors associated with patients' adherence with anti-glaucoma medication regimens in South India.
Objectives: 1. To ascertain the socio-economic and demographic profile of patients attending glaucoma clinics. 2. To assess the pattern of anti-glaucoma medication procurement and usage (i.e., medication regimen used, medication procurement, medication instillation). 3. To study financial, physical, and other barriers to good medication adherence. 4. To assess patients' level of adherence to prescribed medication regimen. 5. To study strategies to facilitate better adherence to medication regimen (e.g., enabling patients to pick up medication supply at office).
Design: Hospital / clinic based interview survey.
Participants and Methods: Physician's experience and anecdotal information was used to design a questionnaire covering all the objectives to find out the adherence of antiglaucoma therapy. A trained counselor did the interview on 318 patients attending the glaucoma clinic in aravind eye hospital, pondicherry. All the 318 patients were established patients of glaucoma and attending the glaucoma clinic for more than a year.
Main outcome measures: Self-reported adherence to anti-glaucoma therapy.
Results: Of the 318 patients 59.4% surveyed were male, and 40.6% were female. Age of patients surveyed ranged from 18 81. Mean age = 58.6 (sd 11.3). More than 70% of the patients were urban and 18% of the patients were rural. Patients on one medication are 70%, two medications are 30%, and 9% taking three medications. Physical dependency on others to administer medications was 37.4% and 55.7% of patients reported taking medications for other medical problems, with high blood pressure and diabetes medications being the most common. Financial dependency on others for purchasing medications was 20.1% and 68.8% of dependent patients reported that they do mind bothering the person who helps financially to get the medication. 27.4% of patients reported glaucoma medication costs as a burden. 14.5% reported that they would prefer to receive a sufficient amount of medications to last to their next visit.
Conclusion: Cost, obtaining medications and self-sufficiency are burdens for adherence to anti-glaucoma therapy.
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11.20. Medical treatment: Other

P345 OBJECTIVE MEASUREMENT OF PERIOCULAR PIGMENTATION

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Objective: We have previously shown that periocular pigmentation can be a significant side effect that is more commonly seen with the use of certain topical prostaglandins analogues (Ophthalmology 2006; 113: 1961-1967). These skin changes are difficult to evaluate in an objective manner. This study evaluated the utility of the Minolta cr-400 chromameter in objectively measuring periocular and facial pigmentation in normal subjects of different ethnicities.
Design: Prospective cross sectional, non interventional study in normal subjects from 3 ethnic (African-American, Caucasian and Hispanic descent) and Fitzpatrick groups (n=25 each group).
Testing: The cr-400 chromamater was used to obtain skin color measurements from 16 facial and periocular locations.
Main outcome measures: Two-sample independent t-tests were used for comparing means between ethnic and Fitzpatrick groups. Reliabilities among replicates and among different locations were estimated using the intra-class correlation coefficients (ICC) and their 95% confidence intervals. Inter-instrument comparisons of ICC values were based on the Fisher's z-approximation.
Results: Significant differences in l* (light to dark spectrum) were observed among the 3 ethnic groups in all measurements locations ($p<0.05$), while differences in a* (red to green scale) were seen between the more heavily pigmented groups only. However, considerable variability in pigmentation was noted among ethnic groups. Comparison of pigmentation among Fitzpatrick groups showed differences between heavily pigmented groups only, with l* being most sensitive ($p<0.05$). Within the studied groups, no differences were present among the 16 locations of measurements. The cr-400 demonstrated excellent inter-instrument reliability as determined by ICC.
Conclusions: The Minolta cr-400 chromameter objectively and reliably detects differences in skin pigmentation within ethnic groups and certain Fitzpatrick groups. Overall, l* appears to be the most sensitive to differences in pigmentation. The variability in skin pigmentation within ethnic groups suggests that studying change of skin pigmentation from baseline in an individual rather than pooled data would reflect change more accurately. Furthermore, the uniformity of pigmentation in the periocular region within an individual

suggests that 1-2 readings per individual would suffice for baseline measurements. The cr-400 chromameter is an excellent instrument to objectively measure changes in periocular pigmentation from prostaglandin analogues and in other conditions that might alter skin pigmentation.

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P346 COST-EFFECTIVENESS ANALYSIS OF FIXED COMBINATION THERAPIES GANFORT, DUOTRAV AND XALACOM IN EUROPEAN COUNTRIES

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Purpose: Ganfort is a fixed combination product containing bimatoprost 0.03% and timolol 0.5% for lowering IOP of patients with glaucoma or ocular hypertension. Fixed combination products including ganfort, xalacom (latanoprost 0.005% and timolol 0.5%) and duotrav (travoprost 0.004%and timolol 0.5%) have the advantage of being more convenient due to qd administration. Since no head to head studies compare the three combination products, an indirect comparison is used based on available clinical data. The purpose was to investigate the cost-effectiveness of fixed combination therapies in eight European countries: United Kingdom, Denmark, Sweden, Norway, Finland, France, Italy and Spain.
Design: Analysis was conducted using 3 months data from randomized clinical trials comparing the efficacy and safety of Ganfort, Duotrav and Xalacom vs. Monotherapy with timolol 0.5% or non-fixed therapy with timolol 0.5%.
Participants: Ganfort is represented with one clinical study (n=541). Duotrav clinical data were derived from 3 studies (total n=982 patients). Xalacom is represented with one clinical study (n=517).
Methods: A systematic literature search (January 2007) was conducted in order to identify randomized clinical trials of Duotrav and Xalacom. Studies were selected which had reduction in IOP as primary endpoint and which were comparable with data from a randomized controlled trial of Ganfort with respect to study design, diagnosis and patient population, so that an indirect comparison could be conducted. A total of three trials of Duotrav and one trial of Xalacom met the selection criteria. A decision analytic cost-effectiveness model was constructed. Efficacy and safety data for Duotrav was based on a weighted average of the three trials. The percentage reduction in IOP was calculated based on the baseline IOP and the absolute reduction in IOP. The cost evaluated was cost of medication and clinical visits to an ophthalmologist. All drug costs are market prices inclusive of vat and visit costs are priced using official tariffs. Consistent with evidence in the literature and clinical experience, the cost-effectiveness model assumed that patients discontinuing treatment due to adverse events change therapy and had an extra clinical visit.
Main outcome measures: Cost-effectiveness ratios, representing the cost per percentage reduction in IOP, were calculated for the three fixed combination products.
Results: The cost-effectiveness analysis showed that the cost per percentage reduction in IOP was least costly for ganfort. By using Ganfort therapy, savings per percentage reduction in IOP ranged from €0.12 to €0.58 compared to Duotrav and €0.03 to €0.64 compared to Xalacom.
Conclusions: This analysis concludes that Ganfort is more cost effective than Duotrav and Xalacom in United Kingdom, Denmark, Sweden, Norway, Finland, France, Italy and Spain. Thus, the cost per percentage reduction in IOP is lower for Ganfort compared to Duotrav and Xalacom.

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12. SURGICAL TREATMENT

12.2. Surgical treatment: Laser iridotomy

P347 COMPARATIVE EFFICACY OF BRIMONIDME 0.2%, APRACLONIDINE 1.0% AND DORZOLAMIDE 2% FOR PREVENTION OF INTRAOCULAR PRESSURE (IOP) RISE AFTER ND:YAG ANTERIOR SEGMENT PROCEDURE.

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Aim: To compare the efficacy of brimonidme 0.2%, apraclonidine 1.0% and dorzolamide 2% for prevention of intraocular pressure (IOP) rise after nd:yag anterior segment procedure.
Methods: In a randomized prospective study, forty-five patients underwent anterior segment laser procedure using either bromide 0.2% or apraclonidine 1% or dorzolamide 2% half an hour before and immediately after laser procedure. IOP, heart rate and blood pressure were measured before laser procedure and 1, 3 and 24 hours after and one week after laser procedure.
Results: There was no significant rise in IOP in all the three groups; rather there was a significant decrease in IOP from pre-laser to 1 hour after the laser procedure (p values: $p<0.001$, $p<0.001$ and $p<0.01$) respectively. There was no significant difference in lowering of IOP among all the three groups (mean reduction in brimonidine group 2.2 mmHg, apraclonidine group 2.8 mmHg and dorzolamide group 2.4 mmHg).
Conclusion: The results of this study suggest that brimonidine 0.2%; apraclonidine 1% and dorzolamide 2% are equally effective in preventing the IOP spike after laser procedure.

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P348 QUANTITATIVE EVALUATION OF CHANGES IN ANTERIOR SEGMENT BIOMETRY FOLLOWING PERIPHERAL LASER IRIDOTOMY USING SCHEIMPFLUG IMAGING IN EYES WITH PRIMARY ANGLE CLOSURE

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Purpose: To quantify the effects of peripheral laser iridotomy (PLI) on peripheral anterior chamber depth (PACD), central internal anterior chamber depth (ACD) and anterior chamber volume (ACV) using rotating Scheimpflug imaging system.
Design: Clinic-based prospective, non-randomized, interventional study.
Participants: Sixty-eight eyes of 68 consecutive patients with primary angle closure were enrolled.
Methods: Pentacam scanned the anterior ocular segment with the 25-image acquisition scan protocol and PACD, CACD and ACV values were obtained. The PACD was measured in nasal, temporal, superior and inferior meridia at 4 mm and 8 mm circles. A Nd:YAG laser iridotomy was performed. Pre-iridotomy, immediate post-iridotomy, one-week and one month post iridotomy data for PACD, CACD and ACV was acquired and analyzed using the t test, one-way anova.
Main outcome measures: The change in CACD, ACV, PACD-4 and PACD-8 following PLI.
Results: Anterior chamber volume (ACV) increased immediately after (28.36 mm^3 ;p=0.000), at one week (15.86 mm^3; p=0.000) and at 1 month post LPI (19.76 mm^3; p=0.00). There was no change in CACD (p>0.05). No significant PACD deepening was observed at 4 mm in any meridia other than inferior quadrant (p<0.05). Significant PACD deepening at 8 mm was observed at each meridia (p<0.05) at all visits.
Conclusions: PLI significantly increases the PACD and ACV. The effect is maximal immediately after PLI. There is a demonstrable deepening of the anterior chamber only in the periphery indicating the opening up of angles. Pentacam can be used as an investigative tool for quantitative estimation of anterior chamber biometry in PAC and quantifying the influence of peripheral laser iridotomy on ACD and ACV.

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P349 A STUDY ON LONG TERM OUTCOME OF EYES WITH ACUTE ANGLE CLOSURE AND IN PROPHYLACTIC LASER PERIPHERAL IRIDOTOMY

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Objective: To study the long term outcome of laser peripheral iridotomy post acute angle closure and prophylactic eyes.
Design: Retrospective non-comparative study.
Participants: Fifty-two eyes (27 patients; 17 Malays, 10 Chinese), 23 eyes had acute angle closure and 29 eyes had narrow angle.
Methods: All patients underwent laser peripheral iridotomy (LPI) either for emergency treatment or prophylactic LPI. They were followed up at least for 5 years.
Main outcome measures: Duration of presentation and mean IOP on presentation in the progression to PACG.
Results: The mean IOP at presentation for eyes with acute attack was 49.3 ± 16.1 mmHg. The mean duration of symptom prior to presentation was 29.6 ± 43.8 days. There was significant association with those patients acute attack presented 7 or more days from the initial symptom with development of PACG (p=0.025). 65.2% of eyes had IOP 50 or less and 34.8% of eyes presented with IOP more than 50 mmHg. However there was no difference between IOP of more than 50 mmHg and less than 50 mmHg on presentation in development of PACG (p=0.28). 91.3% of eyes with acute attack developed glaucomatous changes after 5 years and the remaining 8.7% remained narrow angle. Surprisingly, all the eyes with prophylactic LPI developed PACG after 5 years. The mean IOP for post LPI for eyes with acute attack was 25.9 ± 11.5 mmHg.
Conclusion: Duration of symptoms prior to presentation is an important factor to determine the progression of glaucomatous damage of nerve fibers in acute angle closure glaucoma. The longer of duration of presentation will cause more nerve fibers damage and developed to PACG. Late

presentation of patient acute angle closure glaucoma is the main contributing factors in higher percentage of progression to PACG. Therefore, health care provider especially ophthalmologist needs to create awareness among the public in the prevention of blindness.

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12.3. Surgical treatment: Laser iridotomy

P350 LASER PERIPHERAL IRIDOPLASTY AS EMERGENT INTERVENTION IN TREATMENT OF ACUTE PRIMARY ANGLE CLOSURE: A PREVENTATIVE THERAPY TO PROGRESSIVE ANGLE CLOSURE?

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Purpose: To investigate whether laser peripheral iridoplasty is as effective and safe as conventional systemic medication in treatment of acute primary angle closure (APAC), and the long-term effect as an emergent intervention on prevention from progressive angle closure.
Design: Prospective, nonrandomized, controlled, trial.
Participants and controls: Consecutive patients with APAC were recruited and received one of two treatment options: immediate laser peripheral iridoplasty at daily presentation or conventional systemic medication at night presentation.
Intervention: The laser therapy was performed by frequency doubling-532 laser machine (Nidek, model gyc-2000, Japan). Conventional medication included oral acetazolamide, intravenous 20% mannitol, and topical pilocarpine (2%) and timolol maleate (0.5%). For both groups of patients, intraocular pressure (IOP) was measured at 1 hour, 2 hours, and 6 hours. When IOP was decreased to normal range, laser peripheral iridotomy was performed for both groups. The patients of medical treatment group received laser peripheral iridoplasty within 48 hours after laser iridotomy.
Main outcome measures: IOP, visual acuity, total clocks of peripheral anterior synechiae (PAS), corneal endothelial cell count, requirement for anti-glaucoma medications, and complications of treatment.
Results: A total of 75 patients were recruited into the laser group, and 45 patients into the medical treatment group. There were no significant differences between the two groups in sex, age, presenting IOP, and duration of attack. The laser group had lower IOP levels at 1 hour after the start of the treatment. The difference was statistically significant. Fifty-one eyes (46 patients) of laser group and 25 eyes (21 patients) of medical treatment group were followed up for 6 months. There were no significant differences between the two groups in mean final IOP, total clocks of PAS, and requirement for glaucoma medications. There were no severe complications of laser therapy. Twelve patients received trabeculectomy for uncontrolled IOP, 10 of laser group and 2 of medical treatment group.
Conclusions: Laser peripheral iridoplasty is as effective and safe as conventional systemic medication in treatment of APAC. However, whether its emergent utility has long-term effect on prevention of progressive angle closure in APAC patients needs further follow-up.

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P351 LASER TREATMENT OF PRIMARY ANGLE CLOSURE GLAUCOMA: A RANDOMIZED CONTROLLED TRIAL

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Purpose: To compare the clinical outcome of two laser interventions (laser peripheral iridoplasty combined iridotomy and laser peripheral iridotomy only) in the treatment of chronic primary angle closure glaucoma (cPACG).
Design: Prospective, randomized, controlled trial.
Participants: Consecutive cPACG patients were recruited and randomized to receive one of two treatment options: laser peripheral iridoplasty combined iridotomy or laser peripheral iridotomy only.
Methods: Iridoplasty was performed by frequency doubling-532 laser machine (Nidek, model gyc-2000, Japan). Iridotomy was operated by Nd: YAG laser machine.
Main outcome measures: Intraocular pressure (IOP), visual acuity, total clocks of peripheral anterior synechiae (pas), number of anti-glaucoma medications, complications of treatment, and requirement for trabeculectomy.
Results: A total of 152 eyes (86 patients) were randomized into the laser combination group, and 185 eyes (103

patients) into the iridotomy group. There were no significant differences between the two groups in the base-line data (sex, age, presenting IOP, and total clocks of pas). Seventy-five eyes (40 patients) of laser combination group and 96 eyes (53 patients) of the iridotomy group have been followed up to 6 months. There were no significant differences between the two groups in IOP levels, visual acuity, total clocks of pas, number of anti-glaucoma medications at the 6-month follow-up. Four eyes (6.06%) of laser combination group and 5 eyes (5.75%) of iridotomy group were received trabeculectomy for uncontrolled IOP.
Conclusions: The effectiveness of the two laser treatment options may be equal. Further follow-up is needed.
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P352 EIGHT SHOT ARGON LASER PERIPHERAL IRIDOPLASTY FOR ANGLE CLOSURE EYES
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Objective: To determine whether using moderate laser energy levels with significantly less number of shots has an effect on drainage angle width.
Design: Prospective interventional case series.
Methods: Patients with occludable angles seen at the Glaucoma Clinic, National University Hospital, Singapore had best corrected visual acuity using Snellen chart, slit lamp biomicroscopy, Goldmann applanation tonometry, gonioscopy and ultrasound biomicroscopy(UBM) at the time of recruitment and after laser iridoplasty. Failure to visualize the posterior pigmented trabecular meshwork for 2 or more quadrants by gonioscopy without indentation was considered occludable. Findings were confirmed using ultrasound biomicroscopy (UBM Model 840 Zeiss-Humphrey with a 50Mhz transducer probe). Cases with definite closed angles in the dark on UBM were recruited. Informed consent was obtained. Argon blue green laser with the following setting was utilized for all subjects: power 0.4-0.7W, 150-200ms duration and 100m-200m spot size. A total of 8 shots in 4 quadrants (360º), with 2 shots per quadrant were delivered per eye. Repeat UBM & gonioscopy were performed within a month post laser.
Results: Thirty seven occludable eyes of 20 Asian patients received 8-shot ALPI. Mean age was 62.05±8.9years (range, 34-72 years). Nine out of 14 primary angle closure suspect (PACS) and 9 of the 16 primary angle closure(PAC) eyes with Shaffer grade 0-II opened to Shaffer grade II 'IV after laser. All chronic angle closure eyes with Shaffer grade 0-I widened to grade II. (See Table 1) Using UBM Pro 2000 software, computed mean AOD(angle opening distance), ARA(angle recess area) and TISA(trabecular iris space area) increased after laser for the 8 patients with complete scans. (Table 2). There was no statistically significant evidence of any deterioration in visual acuity ($p= 0.16$ t38, 0.05 = 1.404) post laser. There was strong evidence that the mean IOP was lower after the laser ($p< 0.001$, t38, 0.05 = 4.699) with a mean decrease in IOP of 2.7mmHg. There was no evidence of an increase in medications used post laser ($p = 1$ $t<0.001$ with 38df). (Table 3)
Conclusion:
Eight (8)-shot argon laser peripheral iridoplasty using moderate energy levels, significantly less number of shots and smaller spot size was effective in widening occludable angles in these case series of Asian eyes.
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P353 THE SHORT-TERM EFFICACY OF SMALL SPOT SIZE ARGON LASER PERIPHERAL IRIDOPLASTY IN THE TREATMENT OF CHRONIC ANGLE-CLOSURE IN ASIAN EYES
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Aims: Argon laser peripheral iridoplasty (ALPI) involves the application of contraction burns to the peripheral iris, with consequent opening of the aqueous drainage angle. Most accounts of ALPI in both Asian and Caucasian irises report a laser spot size of 300 to 500 um. This retrospective descriptive study evaluates the short-term efficacy of small spot size (100 um) ALPI in Asian irises, in the context of chronic angle closure.
Methods: Twelve(12) eyes with chronic angle closure underwent ALPI in the year 2006, all of which had dark Asian irises. The laser spot size used was 100 um, and the duration of each laser pulse was 0.2 seconds. The laser energy level was adjusted so that the following end points were achieved: (1) deepening of the anterior chamber (2) the formation of small gas bubble (3) visible localized iris contraction. Anterior segment optical coherence tomography (AS-OCT) was performed on all patients before and after ALPI.
Main outcome measures: Compared pre- and post-ALPI were: degree of angle opening(AOD & ARA) on AS-OCT,

intraocular pressure (IOP), visual acuity (VA), and need for IOP-lowering eyedrops. The presence of an IOP spike immediately after ALPI, and the development of any complications post ALPI (corneal burns, pupil distortion, iritis, pigment dispersion, hyphaema) was also described.
Results: After ALPI with a laser spot size of 100 um, all 12 eyes had evidence of angle opening on AS-OCT. The IOP and VA were stable after ALPI, and one eye had a reduced requirement for IOP-lowering eye-drops. None of the eyes had an IOP spike immediately after the procedure. One eye developed iris pigment dispersion after ALPI, but there were no other complications reported after the procedure.
Conclusion: The short-term efficacy of small spot size (100 um) ALPI in the treatment of chronic angle closure in Asian eyes is comparable to that of conventional ALPI with larger spot sizes. The theoretical advantages of using a smaller spot size in ALPI include increased energy efficiency, less disruption of the iris architecture, decreased pupillary distortion, reduced iris inflammation, and potentially less corneal damage.
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12.4. Surgical treatment: Laser trabeculoplasty and other laser treatment of the angle

P354 EFFECT OF SELECTIVE LASER TRABECULOPLASTY AND PROSTAGLANDINS ON DIURNAL IOP FLUCTUATIONS: RANDOMIZED CLINICAL TRIAL

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Introduction: The measurement of intraocular pressure (IOP) is essential in the diagnosis and management of open-angle glaucoma, but a single measurement may or may not reflect what the IOP is at other times of the day or night. A report by Asrani et al. suggested that the range of the diurnal fluctuation may be an independent risk factor. Selective laser trabeculoplasty (SLT) is safe and effective in reducing IOP but its effect on diurnal IOP fluctuation is warranted.
Purpose: to evaluate the effect of SLT on daytime tension curve; to compare the effect of SLT and latanoprost on diurnal intraocular pressure fluctuation.
Design: Prospective, randomized, masked clinical trial.
Methods: All newly diagnosed patients with open angle glaucoma and ocular hypertension requiring treatment were randomized and recruited into one of the two arms of the study. It is a feasibility study, 40 patients recruited into two groups, laser treatment or medical treatment. Chief investigator and patients were aware of mode of treatment, but the other two investigators were masked. Pre and post treatment daytime tension curve was plotted.
Results: The mean pre treatment IOP was 26.0 ± 5.45 mmHg and 25.50 ± 3.45 mmHg for SLT and Xalatan group respectively. SLT group: Pre treatment mean IOP fluctuation of 6.33 ± 2.17 mmHg was reduced to 2.95 ± 1.21 mmHg following laser treatment. Latanoprost group: Pre treatment mean IOP fluctuation of 6.26 ± 1.28 mmHg reduced to 1.74 ± 1-4 mmHg following treatment with latanoprost drops.
Conclusion: Both SLT and latanoprost significantly reduces IOP and latanoprost is also known to reduce IOP fluctuations. Our study evaluated the response of SLT on diurnal fluctuation and compared it to standard medical treatment, latanoprost. Both treatment modalities successfully reduced IOP and IOP fluctuations.
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P355 MICROPULSED DIODE LASER TRABECULOPLASTY: A PILOT STUDY WITH A ONE YEAR FOLLOW-UP

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Objective: The goal of this pilot study was to determine whether micropulse diode laser trabeculoplasty (MDLT), performed with sub-visible-threshold laser applications that produce neither visible intraoperative endpoint nor late tissue changes (subthreshold), is an effective and safe method to lower intraocular pressure (IOP) for a clinically meaningful duration in patients with medically uncontrolled open angle glaucoma (OAG).
Design: case series.
Participants and Methods: Thirty-two eyes of 20 consecutive patients with uncontrolled oag (12 bilateral and 8 unilateral) were treated with confluent subthreshold laser applications over the inferior 180° of the anterior tm using an 810 nm diode laser in a micropulse operating mode. The IOP was measured at baseline and at 1 hour, 1 day, 1 week, 3, 6, 9 and 12 months post treatment. Flare was measured with a Kowa fm 500 flare-meter at baseline and at 3 hours, 1 day, 1 week and 12 months post treatment. After treatment, the patients were maintained on their pretreatment drug regimen.
Main outcome measures: Criteria for treatment response were IOP reduction ≥ 3 mmHg and IOP lower than 21 mmHg within the first week after MDLT. Eyes with IOP greater

than 21 mmHg or IOP reduction ≤ 3 mmHg during the follow-up were considered treatment failure.
Results: Six eyes (19%) with a mean baseline IOP of 25.3 ± 3.2 mmHg did not respond to treatment during the first week. Two eyes of one patient failed at the 6 month visit. The treatment was successful in 24 eyes (75%) at 12 months. The IOP was significantly lower throughout follow-up (f=45.91; p<0.01). The mean IOP reduction in the 24 respondent eyes was 22% and 16 eyes (66%) had IOP reduction ≥ 20%. One eye with pigmentary glaucoma experienced a significant increase of flare associated to an IOP spike (34 mmHg) that was controlled with systemic drugs during the first two postoperative days; afterwards it qualified as a success and completed the study. No increase of flare was found in any other patient. No peripheral anterior synechiae formed.
Conclusions: In this case series, subthreshold micropulse diode laser trabeculoplasty (MDLT) was effective in reducing IOP in 75% of medically insufficiently controlled oag eyes without significant complications. This justifies randomized clinical studies to compare MDLT with current IOP lowering strategies such as argon laser trabeculoplasty (ALT), selective laser trabeculoplasty (SLT) or increased glaucoma medications.

P356 THE INITIAL RESULTS OF DIODE AND ARGON LASER TRABECULOPLASTY IN PRIMARY OPEN-ANGLE GLAUCOMA AFTER FAILED FILTERING SURGERY
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POSTER WITHDRAWN

P357 SELECTIVE LASER TRABECULOPLASTY: LONG TERM RESULTS
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Purpose: To evaluate long term IOP reduction following SLT. To establish the survival time of SLT.
Design: Retrospective case study.
Participants: All patients who underwent SLT at Clayton Eye Centre, Wakefield between January 2000 and December 2005.
Method: Retrospective case study of all the patients who underwent SLT between January 2000 and December 2005 was done. SLT was performed as primary, adjunctive and replacement treatment. Base line IOP prior to SLT and IOP post SLT was recorded at week 1, month 1, month 3, month 6, year 1 and from then on annually. Response to SLT was defined as a 20% drop from the baseline level.
Results: 546 eyes of 308 patients were analysed. Patients in the primary group received SLT as the initial treatment, whereas patients in the secondary group received SLT as either replacement or adjunctive treatment. In the primary group (n=279) a 33% reduction in the mean IOP was seen over a period of 38 months. In the secondary group (n=267) a 29% reduction in the mean IOP was seen over a period of 24 months. The probability of an eye maintaining 20% reduction of IOP from baseline over a period of 5 years was 50%. High baseline IOP was the most statistically significant predictor of the degree of IOP reduction post SLT.
Conclusions: SLT is a safe and effective treatment modality and reduces IOP successfully in both primary and secondary treatment. IOP reduction is very strongly related to baseline IOP. The probability of an eye successfully completing 5 years after first treatment of SLT is 50%.
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P358 TREATMENT OF ANGLE CLOSURE GLAUCOMA BY SELECTIVE LASER TRABECULOPLASTY (SLT)
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Purpose: To assess the efficacy and safety of selective laser trabeculoplasty (SLT) as a treatment for primary angle closure glaucoma (PACG).
Design: A multicenter uncontrolled trial.
Participants: Sixty seven eyes with PACG, a patent peripheral iridotomy and a clear view of at least 90 degrees of the angle.
Intervention: All the visible pigmented trabecular meshwork was treated by SLT.
Results: The mean baseline IOP was 24.7±2.5 mmHg. It was reduced by 21.9% to 19.3 mmHg in the 64 eyes that reached 3 months of follow up and by 22.2% to 19.2±2.5 mmHg in the 56 eyes that reached the 6 months time point. There were no significant or permanent complications.
Conclusions: SLT seems to be an effective and safe method of treating PACG eyes with a patent iridotomy if at least a quarter of the angle is visible.

P359 A RANDOMISED PROSPECTIVE STUDY INVESTIGATING THE OPTIMUM POWER FOR SELECTIVE LASER TRABECULOPLASTY IN OCULAR HYPERTENSION AND OPEN ANGLE GLAUCOMA.

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Introduction: Although selective laser trabeculoplasty (SLT) is accepted as a viable treatment for ocular hypertension (OHT) and open angle glaucoma (OAG), there has not been a thorough assessment of the optimum laser power settings which enable safe and effective treatment. This study aims to compare high power settings with low power settings in lowering intraocular pressure.
Objective: To assess and compare lowering of IOP with 1.2 mj power burns and 0.6 mj power burns in patients receiving selective laser trabeculoplasty.
Design: Randomized control trial.
Participants: Forty eyes of 20 patients with POAG and OHT were recruited for the study.
Methods of testing: All patients received selective laser trabeculoplasty and were randomized into two groups. Group 1 consisted of 20 eyes and received 0.6 mj burns. Group 2 consisted of 20 eyes and received 1.2 mj burns. All patients were seen on week 1, month 1, month 3 and month 6.
Main outcome measures: Correlation of IOP drop with laser energy used.
Result: In the 0.6 mj group (n=20), 43 % (n=9) were responders at 6 months. Responders showed a drop of 24.4% from baseline IOP. 24% patients (n=5) showed a drop of more than 25%, 9% (n=2) showed a 10 % drop.1 patient died during the study. In the 1.2 mj group (n=20) at 6 months 76% (n=16) were responders. Amongst responders a 27% drop from baseline IOP was seen. 57% (n= 12) showed a drop of more than 25% from base line. 19% (n=4) showed a drop between 10 and 25 percent.
Conclusion: Though selective laser trabeculoplasty is an effective treatment for reducing intraocular pressures, the energy level of the burns needs to be titrated depending on the pigmentation of the trabecular meshwork and the reaction seen after the first burn. Angles with normal or reduced pigmentation require a higher energy burn and hence target IOP may not be achieved with lower energy burn (as seen in group 1) thus resulting in a higher rate of non responders. Caution needs to be exercised in eyes with heavily pigmented angles where a lower energy and fewer laser spots may be desirable.
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P360 INTRAOCULAR PRESSURE REDUCTION AFTER SELECTIVE LASER TRABECULOPLASTY IN PATIENTS WITH CHRONIC OPEN ANGLE GLAUCOMA

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Objective: To determine the efficacy and safety of selective laser trabeculoplasty in patients with chronic open-angle glaucoma.
Methods: Retrospective study.
Participants: Thirty-one eyes of 28 patients with chronic open angle glaucoma who underwent selective laser trabeculoplasty from February 2006 to September 2006 at the Asian Eye Institute.
Intervention: Using a frequency-doubled q-switched 532-nm Nd:YAG laser. A total of approximately 50 spots were placed over 180 degrees of the trabecular meshwork at energy levels ranging from 0.7 to 0.9 mj.
Main outcome measures: Main outcome was IOP reduction of > 3 mmHg from baseline. IOP was measured 1 week and 1, 3, and 6 months after treatment.
Results: Mean + sd age of study population is 64.9 + 12.3 y/o. 53.6% were males and 46.4% were females. Preoperative mean + sd IOP was 18.1 + 2.6 mmHg. The mean IOP reduction from baseline at 1 week, 1 , 3 and 6 months post-laser treatment was 4 mmHg (22.1%) , 4.4 mmHg (24.3%), 2.5 mmHg (13.8%) and 2.7 mmHg (14.9%).
Conclusion: SLT has shown reasonable efficacy in lowering IOP over 6-month follow-up, but there was a tendency for IOP to increase with a longer follow-up. Long-term follow-up studies with a large sample size are needed to determine whether the IOP lowering effect is sustained over time, and to assess the efficacy of SLT.
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P361 TITANIUM SAPPHIRE LASER TRABECULOPLASTY: A RANDOMISED CLINICAL TRIAL

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Purpose: To report the treatment results of long-wavelength (780nm) titanium sapphire laser trabeculoplasty (TI-SALT) versus bimatoprost.
Design: Prospective, randomised, double masked, placebo controlled clinical trial.
Participants: Newly diagnosed treatment naïve patients

with ocular hypertension, primary open angle glaucoma and glaucoma complicating pigment dispersion syndrome.
Intervention: Subjects were randomised to receive either TISALT and placebo drops or bimatoprost and sham laser.
Main outcome measures: Intraocular pressure.
Results: Twenty eyes of 10 patients were treated with equal numbers in each study arm. Seven patients were men, mean age was 64 years (range 54-78). Eyes treated with TISALT and placebo drops had an average IOP increase of 22.4%; three eyes responded poorly and seven eyes did not respond, of which two had an IOP increase of 33% and two an increase of 80%. Eyes treated with bimatoprost and sham laser had an average intraocular pressure (IOP) reduction of 17.1%; seven eyes responded to treatment (>20% reduction), one eye responded poorly (<20% reduction) and two eyes of one patient did not respond.
Conclusions: TISALT using a 780 nm laser was associated with a significant risk of a severe IOP rise. Results were much poorer than those reported previously with conventional SLT. The trial was terminated early and we no longer use TISALT.

P362 IMPROVEMENT OF TONOGRAPHIC OUTFLOW FACILITY FOLLOWING SELECTIVE LASER TRABECULOPLASTY (SLT) IN OPEN ANGLE GLAUCOMA.
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Purpose: Selective laser trabeculoplasty (SLT) has been hypothesized to increase trabecular outflow although the precise mechanism for the decrease in IOP following SLT therapy is not yet known. This study evaluated the changes in tonographic aqueous outflow facility following SLT therapy in patients with open angle glaucoma (OAG) and ocular hypertension (OHT).
Method: A retrospective review of charts of 9 eyes of 7 subjects with either oag or OHT who received SLT therapy was conducted. A 2-minute pneumotonography (Meditronic Solan model 30) was performed at 1 week before and 6 weeks after SLT. The change in IOP, coefficient of facility of aqueous outflow (c-value, µl/min/mmHg) and PO/C, where PO denotes resting baseline IOP, were determined.
Results: Four eyes were diagnosed as OHT, three eyes as pseudoexfoliation glaucoma and two eyes as primary open angle glaucoma. There were 6 females and 1 male with a mean age of 69 ± 9.9 years. 6 eyes received SLT as a primary therapy without any additional therapy and 3 eyes received SLT as a secondary therapy without any changes in glaucoma medications. Five eyes received 360 degree and the four eyes received 180 degree of SLT. Mean baseline applanation IOP prior to SLT therapy was 24.8 ± 1.8 mmHg which decreased to 16.8± 3.3 mmHg (mean IOP reduction of 8.2 ± 4 mmHg or 31% ± 14%) at 6 weeks after SLT therapy. The outflow facility (c value) improved in all eyes except one eye of OHT in which it remained unchanged despite reduction in IOP by 33%. Prior to SLT therapy the mean value of outflow facility (c value) was 0.24 ± 0.11 and the mean PO/C 103.9 ± 51. At 6 weeks following SLT therapy the mean c value improved to 0.35 ± 0.08 (or by 66%) and mean PO/C improved to 56.7 ± 47 (or by 45%) which were statistically significant (p value 0.04 and 0.01 respectively).
Conclusion: SLT treatment significantly improved tonographic outflow facility in 8/9 eyes. This supports the hypothesis that SLT reduces IOP most likely by an effect on trabecular outflow. Given that one patient showed a decrease in IOP without a change in outflow facility suggests other mechanisms of IOP reduction may also occur, such as uveoscleral outflow, which was not measured in this study.

P363 SELECTIVE LASER TRABECULOPLASTY IN INDIAN EYES
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Objective: To study the safety and efficacy of selective laser trabeculoplasty in lowering the IOP in open angle glaucoma in Indian eyes.
Design: Non-randomized, prospective, interventional study.
Participants: Thirty eyes of twenty two Indian patients with open angle glaucoma who underwent selective laser trabeculoplasty were included in the study.
Intervention: Selective laser trabeculoplasty (SLT) was permormed in eyes with POAG or pseudoexfoliation glaucoma. In 5 patients, SLT was performed as the primary treatment. The remaining patients were already on glaucoma medications with inadequate IOP control. None of the eyes had previous SLT/alt or glaucoma surgery. SLT was performed in the temporal 180 degrees in all patients.
Main outcome measures: We studied the drop in IOP following SLT. The safety of the procedure was also studied.
Results: Mean pre-treatment IOP was 23.6 mmHg. Mean IOP at 6 months following treatment was 19.3 mmHg. Mean decrease in IOP was 4.2mmHg. Sixty-seven percent of the patients had an IOP decrease of more than 3 mmHg. Fourteen percent of the eyes showed no change in IOP. Four patients had a transient spike in IOP which settled within 1 to 2 weeks. No other serious side effects were noted.
Conclusions: SLT appears to be a safe and effective procedure in the management of eyes with POAG. Longterm studies in a larger group of of patients would be required.
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P364 SELECTIVE LASER TRABECULOPLASTY AS ADJUNCTIVE TREATMENT FOR OPEN-ANGLE GLAUCOMA

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Purpose: To investigate the efficacy and safety of selective laser trabeculoplasty (SLT) as adjunctive treatment of open-angle glaucoma (OAG).
Patients and Methods: A prospective non-randomised clinical trial was performed in the department of ophthalmology in Afyon Kocatepe university. Patients diagnosed OAG were assigned to selective laser treatment. All patients underwent complete ophthalmic evaluation before and at intervals after treatment. A total of approximately 50 spots were placed over 180º of the trabecular meshwork. Patients were followed up 1 week, 1 and 3 months. The primary outcome of the study was the intraocular pressure (IOP) lowering effect of SLT. 'Success' of the laser treatment was defined as a reduction of ³20% of pre-treatment IOP and 'response' was defined as .3 mmHg decrease of IOP with no additional antiglaucomatous interventions. The hypotensive medication during the study remained unchanged.
Results: Twenty eyes of 20 patients were enrolled. The mean baseline IOP was 19.8±2.1. The average absolute and percent reductions in IOP were 2.4±1.5 mmHg or 12.1% in month 1 and 2.7±1.0 mmHg or 13.4% in month 3. The success rate was 25% in month 1 and 20% in month 3. The response rates were 45% in month 1 and 60% in month 3. There was no significant complication.
Conclusion: SLT was found to be efficacious and safe as additional therapy in reducing IOP in oag over 3 months. Long-term follow-up studies with a large sample size, and studies comparing the efficacy of 360º and repeated SLT treatment are warranted.

P365 SELECTIVE LASER TRABECULOPLASTY: RE-TREATMENT A VIABLE OPTION!

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Purpose: To determine the effect of selective laser trabeculoplasty re-treatment.
Design: Five hundred forty-six eyes of 315 patients treated with SLT between 2000 - 2005.
Participants: Seventy-nine patients with SLT enhancement / repeat treatment were selected.
Methods: Re-treatment divided into: (1) SLT enhancement: treating virgin TM following initial 180º treatment. (2) SLT redo / repeat: retreating previously treated TM.
Main outcome measures: (1) Pre-treatment and post-treatment IOP recorded at regular intervals. (2) Statistical analysis was done. (3) SLT survival period calculated, i.e., duration after treatment for which 20% IOP drop was maintained.
Results: (1) 42 patients underwent SLT enhancement and 37 repeat RX. (2) SLT enhancement: IOP drop following SLT enhancement was 25% (p value <0.001) @ year 1, 18.7%(p value<0.01) @ year 2 32% (p value <0.001) @ year 3. (2) Repeat SLT :- IOP drop following repeat SLT was 21% (p value<0.001) @ year 1, 12.2% (p value <0.01) @ year 2 28.4%(p value<0.001)@ year 3. (3) Survival time for SLT enhancement is 18.6 months. (4) SLT redo is 12.4 months.
Conclusions: (1) SLT is safe and effective treatment modality not only as initial treatment. (2) SLT enhancement and repeat SLT are equally effective. (3) Adverse effects were again transient and minimal. (4) No pas noted yet. (5) SLT evolves as a treatment for open angle glaucoma.
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12.8. Surgical treatment: Filtering surgery

P366 THE SAFETY AND EFFICACY OF MICROTRABECULECTOMY

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Purpose: To determine the efficacy and safety of microtrabeculectomy.
Design: Retrospective case review.
Participants: Patients who had undergone microtrabeculectomy (small flap trabeculectomy) performed by a single surgeon at the essex county hospital, Colchester, UK from January 2001 till August 2005.
Methods: The intraocular pressure (IOP) and number of antiglaucoma medications were recorded preoperatively and postoperatively. Early and late postoperative complications were noted. The results were compared with the national survey of trabeculectomy and also other published studies on microtrabeculectomy. Statistical method used was Wilcoxon signed rank test.
Main outcome measures: The IOP at the last visit.
Results: Thirty-three eyes of 26 patients (mean age 70 years) were included. There were 16 males and 10 females. The mean IOP at diagnosis was 36.0 mmHg. The mean preoperative IOP was 26.7 mmHg (22-40 mmHg) and the number of mean preoperative medication used was 2.6 (range 1-4). The mean duration of treatment prior to surgery was 80 months. The mean postoperative IOP was 13.4 mmHg (median 13 mm, range 6-22 mmHg) at the last visit (mean follow-up 22.8 months (6-60 months)). The number of mean postoperative medications for all patients was 0.5. Nine eyes were still receiving antiglaucoma medications (mean-1.9, range 1-3) postoperatively and IOP was controlled. There was a significant reduction in IOP (p<0.001) and number of medications (p<0.001) postopera-

tively. Early postoperative complications were choroidal detachment (n=12, 36%), hyphaema (n=4, 12%), wound leak (n=7, 21%), shallow anterior chamber (n=5, 15%) and hypotony (n=6, 18%). The main late complications were cataract (n=7, 21%) and encapsulated bleb (n=3, 9%). One case (3%) failed which required a repeat trabeculectomy.
Conclusion: Microtrabeculectomy is an effective and safe procedure. Its success rate is comparable to conventional trabeculectomy.
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P367 LONG TERM FOLLOW UP OF TRABECULECTOMY WITH ADJUNCTIVE POST-OPERATIVE TOPICAL MITOMYCIN (MMC) IN UNCOMPLICATED GLAUCOMA
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Purpose: To investigate the efficacy of a new technique of MMC application as adjunct of trabeculectomy.
Methods: Forty-nine eyes with POAG had trabeculectomies followed by topical MMC 0.05 mg/ml 4- times/day/10 days (study group) were matched with 49 that had trabeculectomy alone (control group).
Results: Mean follow-up was 42.3 and 43.9 months. Qualified success (IOP <21 mmHg with meds) was 91% in study group and 82% in controls. Complete success was 84% and 69% respectively (p=0.02). Study group patients were using 0.7±1.2 medications compared with 2.1±1.4 in controls (p=0.0001). Transient hypotony, shallow chamber and choroidal detachment were seen more in the study group.
Conclusion: Topical MMC following trabeculectomy improves IOP control and reduces the need for medications.

P368 COMBINED VISCOCANALOSTOMY-TRABECULECTOMY (VISCO-TRAB) FOR MANAGEMENT OF FAR-ADVANCED GLAUCOMA; EVALUATION OF THE EARLY POSTOPERATIVE COURSE.
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Purpose: To study the efficacy and safety of combining viscocanalostomy with trabeculectomy (VISCO-TRAB) for treating far-advanced glaucoma in terms of producing maximally low target IOP in the early postoperative period without excessive external filtration and hypotony-related complications and without inducing pressure spikes.
Design: A prospective case-control study.
Participants and controls: Patients with far-advanced glaucoma (severe to near total loss of neuroretinal tissue and tubular field defect) in the last year treated with combined visco-trab. A control group of patients with far-advanced glaucoma, treated by trabeculectomy (TRAB) with mitomycin in the last 2 years was used for comparison.
Methods: Combined VISCO-TRAB constituted subconjunctival mitomycin, 4x4 mm lamellar scleral flap, dissection of second flap until Schlemm's canal (SC) was unroofed, viscoelastic injection into SC, penetrating trabeculectomy anterior to SC, peripheral iridectomy, and water tight closure of lamellar flap.
Main outcome measures: The postoperative course (IOP, vision, operative and postoperative complications and need for laser suture lysis) within the first 3 months were studied and compared between both groups.
Results: The study included 39 eyes in VISCO-TRAB group and 40 eyes in TRAB group. Separate-site phacoemulsification was done in 18 eyes in group 1 and 15 eyes in group 2. Operative and postoperative complications were comparable between both groups with less severe hypotony-related and laser suture lysis (LSL)-related complications in the VISCO-TRAB group. The interval between surgery and LSL was longer (16.0 days) after VISCO-TRAB than after TRAB (11.7 days). Mean IOP was significantly lower in the VISCO-TRAB group than the TRAB group during the first month ($p<0.001$) and of border line significance at 3rd month follow-up ($p=0.06$). Combined PHACO-VISCO-TRAB adequately reduced IOP in the early postoperative period in a similar way to VISCO-TRAB alone.
Conclusion: Combined viscocanalostomy-trabeculectomy for management of far-advanced glaucoma proved efficacy in reducing IOP to a maximally low target levels early postoperatively and proved safety by reducing the postoperative pressure spikes and the devastating complications related to excessive external filtration.
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12.8.1. Surgical treatment: Filtering surgery: Without tube implant

P369 MULTI-CENTER CLINICAL TRIAL OF TRABECULECTOMY WITH RELEASABLE SUTURE IN PRIMARY ANGLE CLOSURE GLAUCOMA(PACG)
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Objective: To observe whether trabeculectomy with releasable suture in PACG can reduce the incidence of postoperative complications and improve the success of long-term though multi-center clinical trial.
Design: Multi-center, prospective, randomized, clinical trial.
Setting: Anyang Eye Hospital of Henna province, Handan Eye Hospital of Hebei province, Fushun Eye Hospital of Liaoning province, Chenzhou Eye Hospital of Hunan province.
Participants: Ninety-two consecutive patients requiring trabeculectomy for uncontrolled PACG.
Methods: Forty patients (observed group) received trabeculectomy with releasable suture while 52 patients (control group) underwent trabeculectomy with permanent interrupted.
Main outcome measures: The depth of anterior chamber, intraocular pressure (IOP), the filtering bleb, visual field, IOP of 24 hours and complication were followed up and compared postoperation 1, 3, 7, 14, 30, 90, 180, 540 days.
Result: One case shallow anterior chamber developed in the observed group, but there were 12 eyes with shallow anterior chamber in the control group. Statistically, there was significant difference between two group.(p=0.008); 4 cases developed choroids detachment and 2 cases developed hyphema in the controlled group.
Conclusion: Use of releasable sutures is an effective way at no extra cost instrumentation to lower intraocular pressure, and to minimize the short-term complication of trabeculectomy.

P370 A NEW MODIFICATION OF TRABECULECTOMY

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Purpose: To compare the efficacy a modified and standard trabeculectomy in open angle glaucoma treatment.
Design: Interventional case series.
Participants: Forty-four eyes of 44 patients with primary open angle glaucoma (mean age 63.6 ± 5.6 years, range, 49-77 years) were operated: 22 eyes with new technique (1st group) and 22 (2nd group) with standard technique of trabeculectomy.
Intervention: The basis features of new modified operation are as follows: (1) limbus-based t-shape scleral flap approximately half of the thickness of sclera dissected; (2) two vertical scleral incision and cyclodialysis in horizontal part of scleral bed performed; (3) scleral block containing Schlemm's canal existed; (4) ends of the horizontal part of the scleral flap is tucked in cyclodialysis slots.
Main outcome measures: The incidence of surgical complications, postoperative IOP in twelve months.
Results: The following early postoperative complications were observed (1st and 2nd group): hyphema (6 eyes, 27.2% and 7 eyes, 31.8%), shallow anterior chamber (2 eyes, 9.1% and 5 eyes, 22.7%), choroidal detachment (1 eye, 4.5% and 4 eyes, 18.2%). Complete success (IOP between 6 and 21 mmHg without glaucoma medications) was achieved in 95.5% (1st group) and in 86.4% (2nd group) at 1 year follow-up.
Conclusions: This study indicates that new technique is more safe and effective than standard trabeculectomy in primary glaucoma treatment.

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P371 PREDICTION OF ANTIGLAUCOMA SURGERY OUTCOMES IN DIFFERENT STAGES OF THE DISEASE ON THE BASIS OF INITIAL IOP LEVEL

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Aim: To analyze indices of initial IOP level and to evaluate their prognostic properties in early postoperative period, depending on the stage of glaucoma and the type of surgery used.
Methods and materials: This study had a prospective, nonrandomized design. Results of observation (case history, medical cards) of 250 patients (250 eyes) were studied for a period from January 2005 to July 2006. In the first stage of the study patients were divided into two groups according to the type of surgery. The first group included 165 patients with glaucoma (male - 117 (71%), female - 48 (29%)), who had undergone filtration surgery (deep sclerectomy and trabeculectomy), and the second - 85 glaucoma patients (male - 66 (77.7%), female - 19 (22.3%), who had non-penetrating type of surgery with or without allodraining. The mean age of patients in the first group was 73.8±8.3 years and in the second group - 73.9±8.3 years.
Conclusions: In the presence of statistically significant differences in initial IOP level ($p<0.05$) there were no significant differences ($p>0.05$) in early postoperative period depending on the type of surgery. Non-penetrating surgery is found to be effective as well in reducing IOP level in early postoperative period. The extent of IOP lowering effect of non-penetrating surgery is commensurable with the effect of trabeculectomy (53-65% for non-penetrating surgery and 56-67% for trabeculectomy). To all appearance, in early and moderate glaucoma with normal and reasonably elevated IOP (≤32 mmHg) after surgery we should expect predicted IOP reduction. Hemodynamic indices in early postoperative period are less predictable in advanced stages of glaucoma with initial high IOP level (≥32 mmHg) (uncompensated glaucoma).

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P372 PERFLUOROPROPANE GAS-BUBBLE AUGMENTED-TRABECULECTOMY IN YOUNG PATIENTS

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Purpose: To evaluate the use of subconjunctival perfluoropropane (c3f8) gas bubble to augment filtering blebs of trabeculectomies in young glaucoma patients.
Methods: Thirty six patients (under 35 years old) with medically uncontrolled glaucomas were classified into 2 groups: group 1 (included 18 eyes and underwent conventional trabeculectomy with limbal-based conjunctival flap) and group 2 (included 18 eyes and underwent trabeculectomy augmented with 0.2 ml of (15% : 85%) c3f8: air gas bubble mixture under the filtering bleb). The patients were followed up after surgery for the intraocular pressures, the bleb morphology and gas bubble criteria.
Results: In group 2 the gas bubbles stayed in the bleb for an average duration of 18.5 days (range 16-25 days) and helped to maintain the filtering blebs until their complete resolution. The success rate was significantly higher in group 2 (89%) than in group 1 (55.6%) after a follow up period of 13 months.
Conclusions: Subconjunctival c3f8 gas bubble helps the maintenance of filtering blebs in the early post-operative period and increases the success rate of trabeculectomy in young glaucoma patients after a follow up period of 13 months.
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12.8.2. Surgical treatment: Filtering surgery: With tube implant or other drainage devices

P373 FUNCTIONAL FILTRATION WITH MINIMAL BLEB FORMATION USING EXPRESS MINIATURE GLAUCOMA DEVICE UNDER A SCLERAL FLAP

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Purpose: Implanting the express device under a scleral flap may result in successful control of IOP (intra-ocular pressure) in glaucoma. Bleb formation, especially large and cystic blebs are undesirable, and may increase complications in the medium to long-term. A study was done to examine the nature of the bleb formed when the express device was implanted under a well-sealed scleral flap with mitomycin c applied under the scleral flap.
Methods: Non-randomized prospective study. Outcome measures included intra-ocular pressure, number of anti-glaucoma medications, bleb size and complications with follow-up reaching two years in 70% of the patients.
Results: Fifty-eight eyes of 50 patients with open-angle glaucoma (OAG) were implanted under a scleral flap with the express miniature glaucoma device. Half (29 patients) had the surgery combined with cataract extraction and intra-ocular lens. Twenty eyes (35%) had received previous glaucoma surgery. There were 32 caucasians, 6 africans, 10 asians and 2 of mixed race in the group. Mean IOP (±SD) dropped from 29.4 mmHg (±6.9, 58 eyes) preoperatively to 13.5 mmHg (±2.8, 58 eyes) at one year and 14.2 mmHg (±2.9, 41 eyes) at two years. The drop in IOP was significant between baseline and one and two years (t test, p=0.000) and there was no difference between the IOPs at one and two years (p=0.263). Eighty-five percent (49 eyes) showed absent or minimal blebs (under 1 mm height) at one year, with 12% (7 eyes) showing medium-sized blebs (1-2 mm)and 3% (2 eyes) showing large blebs (over 2 mm). At two years, 88% (36/41 eyes) had absent or minimal bleb formation with 7% (3 eyes) having medium blebs and 5% (2 eyes) with large blebs. Mean number of medications dropped from 2.5 preoperatively (58 eyes) to 0.02 at one year (58 eyes) and 0.3 at two years (41 eyes). Six eyes required surgery for procedure-related problems. Complete success (IOP≤18 mmHg without anti-glaucoma medications) at one year was 53/58 (91%) and partial success (IOP≤18 mmHg with anti-glaucoma medications) in a further one eye. Complete success at two years was 35/41 (85%) and partial success was seen in a further three eyes. Higher IOPs were seen in the non-caucasian patients and complete success was significantly higher in caucasians at one year (chi-square, p=0.025). There was no association between bleb size and complete success at one or two years.
Conclusions: Implanting the express miniature glaucoma device under a scleral flap resulted in good IOP control, with reduced anti-glaucoma medication and with minimal bleb formation.
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P374 COMPARISON OF SAFETY AND EFFICACY BETWEEN SILICONE AND POLYPROPYLENE AHMED GLAUCOMA VALVES

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Purpose: To compare the safety and efficacy of polypropylene and silicone Ahmed glaucoma valves (AGVS).
Methods: The medical records of 62 consecutive refractory glaucoma patients who had an AGV implantion from March 2003 to December 2005 were reviewed retrospectively. Among 62 patients, 32 patients had polypropylene

AGV implantation (p group) and the other 30 patients had silicone AGV implantation (s group). Postoperative IOP, complication rate, and success rate were compared between two groups.
Results: Both groups showed significant IOP reduction after AGV implantation. Success rate was 69% in the p group and 70% in the s group, showing no significant difference between both groups. Complication rate showed no significant difference between the two groups, but non-tube related complications was significantly higher in the s group (16.7%) than that of the p group (3.1%).
Conclusions: The silicone AGV can reduce IOP effectively, but may be associated with a non-tube related complications.
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P375 SURGICAL TREATMENT OF THE GLAUCOMAS INDICATIONS AND EARLY RESULTS

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Purpose: To study the indications for the surgical treatment of the glaucomas, the stage of disease and the early results.
Design: Retrospective study over five-year period, including 90 eyes of 90 consecutive glaucoma patients.
Intervention: The surgical technique was the same for all eyes-punch trabeculectomy, performed by one surgeon.
Main outcome measures: Disease stage and duration at the time of surgery, condition of the operated eye in the early post operative period.
Results: In the majority of patients the disease is diagnosed in a progressed stage and relatively soon before the operation (54 patients were diagnosed within 2 years before the operation). The trabeculectomies were performed in a relatively advanced stage of the disease: eleven eyes were end stage, 70-progressed stage (based on the visual field loss).
The indications for surgical treatment were rapid development of the visual field loss and inability to reach target pressure under topical or laser treatment. The major intraoperative complications were hyphaema (9 eyes), flat anterior chamber (3 eyes), vitreous loss (1 eye) and phacodonesis (1 eye). Among the early postoperative complications were hypotony (15 eyes), flat anterior chamber (16 patients), striate keratitis (3 eyes), hyphaema (3 eyes). Most of these complications resolved within a couple of weeks.
Conclusions: Surgical treatment of the glaucomas is an alternative to the medical, when the latter proved to be ineffective for reaching the target pressure or when the disease is rapidly advancing. The risk of early postoperative complications is relatively low, compared to the glaucoma left inadequately treated.
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P376 EXPERIENCE WITH THE EXPRESS MINI-SHUNT IN A TRAINING PROGRAM

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Introduction: Trabeculectomy has significant potential for vision-threatening complications and may be difficult for the beginning or infrequent glaucoma surgeon. Recently, the Ex-press™ mini shunt, developed as an alternative to filtration surgery for patients with glaucoma, has been shown to be safe and effective with few complications when it is implanted under a scleral flap even in high risk patients. When compared with trabeculectomy, the Ex-press™ implant had similar IOP-lowering efficacy with a lower rate of early hypotony. The Ex-press™ is a FDA-approved 3-mm long miniature glaucoma shunt. The procedure is easier to perform than trabeculectomy and can be carried out by ophthalmology trainees.
Purpose: The purpose of the study is to describe a simplified technique of implanting the Ex-press™ shunt under a scleral flap and evaluate its efficacy and safety in a teaching program.
Methods: Thirty-four uncontrolled glaucoma eyes had the Ex-press™ r50 model mini shunt implanted under a scleral flap with at least 6 months follow-up. Sixteen (47%) had had previous intraocular surgery. Twelve (35%) were of non-caucasian ancestry. Twenty-two (65%) of these procedures were performed by residents or fellows who had had little previous experience with filtering surgery. Each patient was monitored under a complete ophthalmologic examination for IOP, number of medical treatment, complications and failure. Main outcome measure is IOP.
Results: IOP was reduced from a mean of 22.6 mmHg preoperatively to a mean of 14.5 mmHg at 6 months follow-up. Only one case of transient hypotony with shallow anterior chamber occurred. Post-operative inflammation was

minimal and transient. Four (12%) eyes required laser suture lysis and three needling (9%). There were 2 failures both in high risk eyes. Of those residents or fellows who had previously performed trabeculectomy, all preferred the Ex-press™ shunt.
Conclusion: The Ex-press™ implantation is a relatively simple, rapid and easy to learn procedure resulting in significant IOP reduction with a success and complication rate that compares favorably with trabeculectomy. It can be considered as a relatively safe and effective alternative to trabeculectomy especially in beginning and infrequent glaucoma surgeons.
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P377 USE NEW SYNTHETIVE BIODESTRUCTIVE IMPLANT IN SURGICAL TREATMENT OF SOME FORMS OF REFRACTORY GLAUCOMAS (EXPERIMENTAL INVESTIGATION)
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Introduction: Glaucoma has occupied one of leading places among the reasons of blindness for 40 years all over the world. Despite the polyetiology of the given disease, rising IOP above tolerant, remains to one of leading risk factors in development of a glaucoma. The superfluous cicatrization of outflow tracts iof framed during of antiglaucomatous operations remains the basic problem in surgery of a glaucoma. It consists in an excessive proliferation of fibroblasts and development of a collagen in a zone of interventions under condition of deficiency of antiproliferative factors. For optimization of hypotensive effect of antiglaucomatous operations in the remote postoperative period now the wide circulation was received with surgical interventions with use of drainages-implant from various materials. The increasing urgency is got with search of the new artificial biologically active substances, capable to modulate process of a wound repair and to provide formation of the cicatrix containing insignificant volume of a neogenic tissue, with possessing greater hydrophylic nature and permeability.
Purpose: To study new synthetic intrascleral biodestructive implant and its use in surgical treatment of a glaucoma for formation intrascleral outflow tracts of a watery moisture after carrying out of not deep non-penetrating sclerectomy.
Materials and Methods: Experimental researches were carried out on 20 chinchilla rabbits (40 eyes). To group of animals deep non-penetrating sclerectomy with implantation a intrascleral drainage-implant was spent. Terms of observation have made 1, 2, 4, 12, 24 weeks, 1 year. Morphological researches in a zone of operation were spent by an enucleation of experienced eyes and its bracing to 10 % a solution of neutral formalinum. The zone of operation was filled in paraffin then sections by thickness 4 microns were made. The material was painted hematoxylin-eosinumand and van ginzone investigated under a light microscope.
Results and discussion: In early postoperative terms of observation in all groups of animals smooth current, without strongly pronounced inflammatory reaction is noted. At research of eyes of rabbits after implantation of an offered material only within the first week inflammatory reaction of 1-2-st degree was observed. In a zone of surgical influence the local hyperemia of weak intensity with individual petechial hemorrhages was determined. From second week and up to the end of the period of observation (12 months) eyes were quiet, formation intrascleral cavities with elements of an external filtration in the form of the platen formed in a zone of a surgical intervention is noted. Histological researches have shown evolutionary changes in a connecting tissue and implant, stable fibroblasts reaction providing creation of new outflow tracts iof on intrascleral ways.
Conclusions: Synthetic biodestructive material implant, promoting formation of artificial outflow tracts IOF and the prevention of a superfluous cicatrization of a tissue in a zone of a surgical intervention. Placid postoperative course and high functional rates testify about possibility using of the worked up modification of deep non-penetrating sclerectomy with using new synthetic biodestruction implant for clinical use of patients treatment with some forms of refractory glaucomas.

P378 THE SAFETY AND EFFICACY OF THE ISTENT TRABECULAR MICRO-BYPASS STENT FOR THE TREATMENT OF PRIMARY OPEN-ANGLE GLAUCOMA IN PATIENTS UNDERGOING PHACOEMULSIFICATION: 12 MONTH ANALYSIS
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Purpose: To evaluate the safety of the istent trabecular micro-bypass stent in patients undergoing concurrent cataract and glaucoma surgery.
Methods: Prospective, 24-month, multicenter, multi-country evaluation of 48 patients with uncontrolled primary open-angle glaucoma (including pseudoexfoliation and pigmentary) and cataract. Patients underwent clear cornea phacoemulsification followed by ab-interno gonioscopically-guided implantation of the istent. Forty-two patients completed 12 months of the 24 month study and these data are included in this interim analysis.
Results: At baseline, mean (± SD) IOP was 21.7 (± 3.98) mmHg. At 12 months, mean IOP had dropped to 17.4 (± 2.99) mmHg, a mean IOP reduction of 4.4 ± 4.54 mmHg ($p < 0.001$, 18.3%) at baseline, patients were taking a mean 1.6 (± 0.8) medications. By 12 months, the mean number of medications had dropped to 0.4 (± 0.62)($p < 0.001$). Half the patients achieved an IOP < 18 mmHg and were able to discontinue all ocular hypotensive medications by the 12 month visit. The most commonly reported device-related adverse event was stent lumen obstruction (7 eyes) and the most commonly reported non-stent-related adverse event was stent malposition in which stents still demonstrated reductions in IOP (6 eyes). None of the adverse events were deemed serious.
Conclusion: In patients undergoing concurrent cataract and glaucoma surgery, the istent was safe and efficacious for

the reduction of IOP and medication therapy. While these initial results are promising, longer-term follow up and additional clinical studies are warranted.

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P379 EFFICACY AND SAFETY OF A STAINLESS STEEL GLAUCOMA DRAINAGE DEVICE IMPLANTED UNDER A SCLERAL FLAP.

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Purpose: To evaluate the efficacy and safety of a stainless steel miniature glaucoma drainage device (Ex-Press™) implanted under a scleral flap for the surgical treatment of primary open-angle glaucoma.

Design: Clinical, prospective, single treatment ARM, non-randomized, non-masked study.

Participants: Twenty-five eyes of 24 patients affected by primary open-angle glaucoma.

Methods: The Ex-Press™ device was implanted at the limbus under a scleral flap.

Main outcome measures: Primary outcome: IOP change. Secondary outcomes: side effects and VA changes.

Results: The efficacy was evaluated at a min. follow-up (FU) of 12 months (mean 13.6, max 18 months, n=15) and safety on the entire sample (n=25), with a min. FU of 6 months. Efficacy: preoperative IOP was 27.6 ± 8.5 mmHg; at last follow-up > 12 months (n=15) the IOP was 12.1 +/- 4.2 mmHg (55.9% reduction). The success rate (IOP < 18 mmHg at last visit without medications) was 93.3% (14/15). The second success rate reported (IOP < 15 mmHg at last visit without medications) was 87% (13/15). One patient (6.7%, n=15)) was treated topically at last visit, with 1 medication. Complications: Early postoperative complications were clinically mild and included: postoperative IOP < 5 mmHg: 6 cases (24%, n=25) at 1 day, 7 cases (28%) at 1 week, 3 cases (12%) at 1 month, 1 case (4%) at 3 month; serous choroidal detachment: 3 cases (12%), 2 spontaneously resolved, one case (4%) managed with transconjunctival sutures to tighten the scleral flap at 3 months. In 4 cases (16%) a viscoelastic injection in the anterior chamber was used at 1 day and 1 week. No sight threatening consequences of surgery were observed. Bleb needling, with or without 5fu injection, was used in 4 cases (16%) during follow-up.

Conclusions: Our data support the long-term efficacy and safety of the implantation of this device under a scleral flap (Flap-Ex-Press). The IOP reduction obtained was large, long standing and complications were minimal.

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P380 EARLY CORNEAL CHANGES AND VISUALISATION OF THE AHMED GLAUCOMA VALVE IMPLANT AS EVALUATED WITH ANTERIOR SEGMENT-OCT AND HRT CORNEA TOMOGRAPH II

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Purpose: To report the early corneal changes and in vivo visualisation of the Ahmed glaucoma valve implant in eyes with refractory glaucoma as well as short-term results with this drainage device.

Design: Case series.

Participants: We studied 10 eyes of 10 patients.

Methods: All patients underwent ahmed valve implant surgery from April 2005 to June 2006. Intraocular pressure (IOP) was measured at different timepoints, and at the last follow-up visit all patients underwent optical coherence tomography of the anterior segment (OCT visante) and HRT cornea tomograph II.

Main outcome measures: We measured the intracameral length of the drainage tube and the distance between the center of the extremity of the tube and the cornea, and iris, as well as the corneal endothelial density on the center of the cornea and in the proximity of the tube.

Results: The mean preoperative IOP was 29.5 ± 11.9 mmHg. At the last follow-up visit (mean 6.3 ± 4.3 months) postoperative IOP was 14.2. ± 4.7 mmHg ($p<0.005$). The mean tube-cornea distance and tube-iris distance were 1.2 ± 0,4 mm and 1.4 ± 0.3 mm respectively and the mean intracameral length of the tube was calculated to be 3.1 ± 0.5 mm. The mean endothelial density was 2168 ± 705 cells/mm² at the center of the cornea and 1923 ± 884 cells/mm² in the cornea close to the tube ($p= 0.5$).

Conclusions: Ahmed valve implant surgery is an effective and safe procedure in advanced glaucoma, at least in short term. HRT cornea II and OCT of the anterior segment of the eye are promising methods for the follow-up of patients with a glaucoma drainage device.

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P381 AHMED GLAUCOMA VALVE TUBE EROSION: A RETROSPECTIVE COMPARATIVE REVIEW OF AUTOLOGOUS PATCH VERSUS DONOR SCLERAL PATCH GRAFT

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Purpose: To determine the proportion of Ahmed glaucoma valve (AGV) transconjunctival tube erosion among patients receiving autologous patch versus donor scleral patch graft.
Design: Retrospective comparative review of an interventional consecutive case series.
Setting: An urban private ophthalmology surgicenter.
Intervention: AGV implantation using autologous patch or donor scleral patch graft to cover the AGV tube.
Main outcome measures: Primary outcome measures were transconjunctival tube erosion. Secondary outcome measures were complications associated with tube erosion. Transconjunctival tube erosion was defined as exposure of any part of the tube through the conjunctiva visible by slit-lamp examination.
Results: A total of 25 eyes of 25 consecutive patients underwent AGV implantation. 14 eyes of 14 patients received donor scleral patch grafts. 11 eyes of 11 patients received autologous scleral patch. There were no erosions noted in tne autologous patch group. 10 out of 14 eyes (71%) in the donor scleral patch graft group showed transconjunctival tube erosions, half occurring during the first 3 postoperative months (earliest 1 month, latest 39 months). 2 out of the total 25 eyes (8.0%) studied developed endophthalmitis, with both eyes belonging to the donor scleral patch graft group and both exhibiting tranconjunctival tube erosion.
Conclusion: The use of autologous scleral patch in AGV implantation appears to be an effective technique in preventing transconjunctival tube erosions. Exposure of the tube is a major risk factor in the development of endophthalmitis.
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P382 DEEP SCLERECTOMY WITH THE EX-PRESS X-200 IMPLANT FOR THE SURGICAL TREATMENT OF REFRACTORY GLAUCOMAS

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Purpose: To evaluate the efficacy and safety of a newly designed Ex-PRESS x-200 drainage device for the surgical treatment of refractory glaucoma.
Design: Prospective, monocentric, non- randomized clinical trial.
Participants: Twenty-eight patients.
Methods: This study was performed on 28 eyes with medically uncontrolled glaucoma and/or previous failed glaucoma surgeries. Deep sclerectomy with x-200 drainage device implantation was performed. Complete examinations including biomicroscopy, best corrected visual acuity (BCVA) and applanation intraocular pressure (IOP) measurements, fundus examination with a vc/d assessment, were performed before surgery, at 1 day, 1 week, and 1, 2, 3, and 6 months after surgery.
Main outcome measures: IOP, BCVA, medication per patient.
Results: Mean age: 72 ± 16 years (mean ± sd). Mean post operative follow-up: 12.9 ± 0.91 months. Mean preoperative IOP: 22.6 ± 6.0 mmHg. Preoperative BCVA: 0.53 ± 0.33. The IOP at 12 months was 12.0 ± 4.6 mmHg and the BCVA unchanged (0.54 ± 0.35). The mean number of medication per patient went from a preoperative value of 2.9 ± 0.9 down to 0.4 ± 0.9 at 12 months postoperative. No major complications were reported. Mitomycin c treatments with needling were given to 11 patients (39.3%). Complete success (IOP ≤ 18 mmHg without medication) was 71.4%, qualified success (IOP ≤ 18 mmHg witht medication) 89.3%, complete failure (further surgery required) 10.7%.
Conclusions: Initial results at 12 months demonstrate that deep sclerectomy with the new Ex-PRESS x-200 implant reduces significantly the IOP with few complications.
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P383 CLINICAL EXPERIENCE WITH VALVE MICRODRAINAGE DEVICE CRABIC IMPLANTATION IN REFRACTORY ADULT GLAUCOMA.

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Objective: To evaluate the results of microsurgery valve device 'crabic' implantation in refractory adult glaucoma in Ukraine.
Methods: In this retrospective case-control study we reviewed 36 eyes of 36 patients. Success was defined as an intraocular pressure (IOP) between 8 and 21 mmHg with or without medications. Without further glaucoma surgery and without loss of light perception and an achievement of 20% of reduction preoperative level of IOP.
Results: The mean follow up was 2-3 years. The primary outcome measure was surgical success (8 < IOP <21 mmHg) without additional glaucoma surgery or devastative complications. Secondary outcome measure included mean IOP and number of medications used at following visits: 1, 3, 6 month, 1, 2 years. No significant difference in success rates were at this periods and were success rates of 64% of device, 36% required glaucoma medications.
Conclusion: The microsurgery valve drainage device provides good intermediate-term success for the treatment of adult refractory glaucoma.
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P384 THE AHMED DRAINAGE IMPLANT IN THE TREATMENT OF REFRACTORY PEDIATRIC GLAUCOMA

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Purpose: To evaluate the efficacy and safety of the Ahmed valve implant in children with refractory glaucoma in early and intermediate follow-up period.
Patients and Methods: A retrospective study included 34 eyes (from 33 patients with refractory pediatric glaucoma, age range at surgery 6 to 15 years) treated with Ahmed valve implant (model s3 or fp8) between 1995 and 2002. We reviewed the final intra ocular pressure, the need for anti-glaucoma medications and incidence of complications in all patients.
Results: The most common aetiology of refractory glaucoma was primary congenital glaucoma (67%) and aphakic glaucoma (9%). After a mean follow-up of 43.7% months (range 9 to 84 months), the mean intra ocular pressure decreased from 35.66 mmHg before surgery to 14 mmHg on the last follow up visit after surgery. Thus, the procedure was successful in 21 eyes (61.7) of cases, 5 of witch did not need anti-glaucoma therapy. The average number of medications used decreased from 4.1 to 1.8. Complications occurred in 16 eyes. Transient postoperative hypotony of <5 mmHg occurred in 14.7% of patients. This was with transient hyphaema, the most common postoperative complication. One patient had severe visual loss and another a tube obstruction.
Conclusion: The Ahmed glaucoma valve implant is an effective treatment for pediatric refractory glaucoma. However, the success rate decreases with the follow up.

P385 THE FIRST POSTOPERATIVE WEEK AFTER EX-PRESS IMPLANT AND TRABECULECTOMY.

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Objective: To compare the efficacy and safety of Ex-PRESS implant and trabeculectomy in a group of pseudophakic glaucomatous patients.
Design: Prospective, randomized clinical study.
Participants: Thirty-four pseudophakic glaucomatous patients, not controlled by medical topical therapy, were randomized in two group to receive ex-press implant or trabeculectomy. All the patients were at the first operation. IOP was higher than 24 mmHg before surgery.
Intervention: 17 Ex-PRESS implants (group a) and 17 trabeculectomy (group b) were performed by the same surgeon, under topical anaesthesia.
Main outcome measures: Variation of IOP after surgery, postop IOP value, complicances.
Results: The preoperative IOP mean value was 26±2.18 in group a and 26.7±1.98 in group b. After 1 week the mean IOP value was 14±4.2 in group a (p=<.001) and 15.4±3.6 in group b (p=<.001). Ex-PRESS implant and trabeculectomy reduced IOP respectively of 45% and 42%. In group a 2 eyes needed an anterior chamber (AC) viscoelastic refilling for an ac flattening. In group b 4 eyes had choroidal detachment, 3 eyes had AC flattening who required an AC refilling, and 2 eyes had hyphema.
Conclusions: Ex-PRESS implant seems to be as effective as trabeculectomy, but it reduces the postoperative complicances and appear safer than trabeculectomy.

P386 LONG TERM INTRAOCULAR PRESSURE LOWERING EFFECTS OF AHMED GLAUCOMA VALVE IMPLANT ON CHINESE PATIENTS WITH INTRACTABLE GLAUCOMA

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Purpose: To report the clinical experience of intraocular pressure (IOP) lowering effect of ahmed glaucoma valve implant on Asian patients with intractable glaucoma.

Design: Case review.
Participants: Sixty-seven eyes (67 Chinese patients) with intractable glaucoma treated with the ahmed glaucoma valve implants were enrolled in this study.
Methods: The mean follow-up time was 52.2 ± 0.8 months. Surgical success was defined as IOP less than 22 mmHg and greater than 5 mmHg without additional glaucoma surgery. Postoperative use of antiglaucoma medications was not a criterion for success or failure. All patients received detail ophthalmic examination including slit lamp, IOP, and visual acuity with best correction in preoperative and postoperative periods.
Main outcome measures: the difference in variables before and after Ahmed glaucoma valve implant surgery was compared by paired t-test.
Results: The mean IOP was reduced from 41.1 ± 11.1 mmHg before surgery to 16.4 ± 5.8 mmHg at the last follow-up after surgery ($p<0.001$). The number of antiglaucoma medications was decreased from preoperative 2.7 ± 1.2 to 0.6 ± 0.2 after surgery ($p<0.01$). The visual acuity was improved or within one Snellen line in 62 eyes (93%). Although complications occurred in 13 eyes, the majority of which did not affect surgical outcome. The success rate by our definition was 88 %.
Conclusion: From our study, it revealed that the ahmed glaucoma valve implant provides as an alternative way to control IOP in Asian patients with intractable glaucoma in long term follow-up.
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P387 EFFECT OF A NOVEL GLAUCOMA DRAINAGE DEVICE ON RABBIT EYES

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Objective: to observe the intraocular pressure (IOP) change and complications in vivo after implantation ATDS on rabbit eyes.
Design: randomized, case-controlled, experimental study. ATDS is a new glaucoma drainage device, which has four functional parts: T shaped tube with lots of micropores distributed, endplate, aqueous humour pool and pressure confined system (PCS)(picture 1). Proved by hydrodynamic tests, PCS can control aqueous humor outflow.
Participants and controls: Ten eyes of 10 rabbits were participated as experimental group, and another 10 eyes were as controls.
Methods: Ten ATDS were implanted into left /right eyes of 10 healthy rabbits, and another 10 healthy rabbits, as controls, were obtained trabeculectomy by leaving one eye of each animal unoperated.
Main outcome measures: At day 0, 3, 7, 14, 28 postoperatively, observed bilateral IOP by Perkin's tonometer, nick leakage by Seidal test, responses of anterior segments of eyeball by slit lamp. The reject reaction includes cornea edema, shallow anterior chamber, Tyndall sign, local opacity of lens, neovascular, hemorrhage, exudation and the site of tube. At day 14, 21, 28 after surgery, inspect the anterior segments, filtration blebs and position of ATDS by ultrasound biomicroscopy. At day 28, ATDS eyes were enucleated, we observed whether there is blockage of T shaped tube and appearance of fibrous layer.
Results: There was no significant difference between bilateral preoperative IOP of all rabbits (left: 15.612±0.765 mmHg, right: 15.503± 0.827 mmHg. $P>0.05$, $n=20$), and the same between the two observed groups ($P>0.05$, $n=10$). On the experimental eyes, IOP dropped stably to the lowest point (9.080 mmHg) two weeks after surgery, and then went up slowly. At day 28 after implantation, it was still lower than that of pre-operation. And IOP of the ATDS eyes were lower than that of the controls significantly at each study point (table 1). No incision leakage happened in ATDS group, and there were less reactions of anterior segments of eyeball than the controlled group (table-2). No tube shift, escape or be blocked in ATDS eyes. In the nucleated eyes, fibrous cysts can be seen around the plate (picture 2).
Conclusions: In this short-term study, ATDS can effectively control aqueous humor outflow at certain pressure, with less complications. A fibrous cyst has formed around the plate and aqueous humor can diffuse through it.
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P388 EXPERIMENTAL FLOW STUDIES OF A NOVEL GLAUCOMA DRAINAGE DEVICE

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Objective: To examine whether the pressure confined system (PCS) of ATDS could consistently produce a pressure drop in the desired target range (6-15 mmHg) at a physiological aqueous flow rate.
Design: Experimental study.
Participants: 15 ATDS were examined. ATDS is a new glaucoma drainage device designed by our department, which has four functional parts: T shaped tube with lots of micropores distributed, endplate, pool of aqueous humour and pressure confined system (PCS) (picture-1).

Methods: ATDS were tested in a flow rig designed to measure the open pressure, the close pressure and the pressure drop of the PCS in the air and the water respectively. The flow rig consisted of a pressure transducer, a PowerLab recorder and one or two three-way lock. Degassed balanced salt solution (BSS) was used to infuse, and a tubing compression pump was used to control the flow rate of 2.0 ul/min. Repeated flow measurements were taken (n=6) for each ATDS.
Main outcome measures: The flow rig for measuring the open pressure was connected as picture-2. We calibrated the pressure reading to zero when the system was filled with BSS except for ATDS. Then the tubing compression pump was started and BSS was infused slowly into PCS. The pressure reading, corresponding to BSS filling all of PCS, was the open pressure. The flow rig for measuring the close pressure was connected as in picture 3. The infusion rate was maintained for 30 minutes and two pressure measurements were taken on the start and the end of PCS at the same time. The difference between the two pressure measurements was then compared, that is the pressure drop. The close pressure was tested using the same flow rig connected as in picture 3. We maintained the flow rate at first, then decreased it from the tubing compression pump gradually. The pressure reading, corresponding to the moment that BSS stopped flowing out of PCS, was the close pressure.
Pressure in the water could be examined when the flow rig was immersed into BSS and infused with colored BSS.
Results: The open and closed pressures of PCS in the air were 7.9-9.7 mmHg and 5.0-7.4 mmHg respectively; and 7.9-9.3 mmHg and 4.9-6.0 mmHg in the BSS. The pressure drop were 7.9-9.0 mmHg and 7.8-9.3 mmHg in the air and the BSS respectively when the flow rate was controlled of 2.0 ul/min (Table 1).
Conclusions: All the 15 ATDS consistently achieved a pressure drop within the desired range (6-15 mmHg). It was shown that PCS could consistently control aqueous humor outflow. As a new glaucoma drainage device, ATDS is accurately enough to provide protection from hypotony in the early period after glaucoma filtration surgery.
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P389 ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY EVALUATION OF ASIAN EYES FOLLOWING CONSECUTIVE LASER PERIPHERAL IRIDOTOMY AND IRIDOPLASTY

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Purpose: To analyze quantitatively using anterior segment optical coherence tomography (ASOCT) the changes in anterior chamber angle, anterior chamber depth, pupil diameter and corneal thickness after argon laser peripheral iridoplasty of primary angle closure (PAC) and primary angle closure glaucoma (PACG) eyes treated with initial laser peripheral iridotomy (LPI).
Design: Prospective observational case series.
Participants: Patients with persistently occludable angles on gonioscopy and following laser iridotomy.
Methods: PAC and PACG eyes post-LPI with residual angle closure on gonioscopy were imaged using ASOCT. Nasal, temporal and inferior angle scans were obtained. Subjects with drainage angles closing in the dark on dark-light provocation test, underwent laser peripheral iridoplasty. Two weeks later, repeat scanning was done. From the images captured, angle opening distance (AOD), angle recess area (ARA), anterior chamber depth, central corneal thickness and pupil diameter were calculated using NUH Eye Department ASOCT Image analysis and processing software.
Outcome measures: Main outcome measure is the degree of angle opening or increase in AOD, ARA (500 µm and 750 µm FRPM the scleral spur) after laser peripheral iridoplasty. Other outcome measures are anterior chamber depth, pupil diameter and central corneal thickness pre and post laser.
Results: Twenty Asian eyes showed significant increase in mean AOD500, AOD750, ARA500 and ARA750 (P = 0.05) of the nasal, temporal drainage angles in the dark and temporal AOD500, ARA500 and ARA750 in the light. Anterior chamber depth did not change significantly (1.97 mm pre and postlaser, P = 0.88). Likewise, pupil diameter and corneal thickness remained unchanged after argon laser peripheral iridoplasty.
Conclusion: In these twenty PAC & PACG Asian eyes with persistently, occludable angles post laser iridotomy, argon laser peripheral iridoplasty produced significant widening of the anterior chamber angle in the dark and minimal increase in the light without changing anterior chamber depth, pupil diameter and corneal thickness.
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P390 ANTERIOR SEGMENT ANALYSIS PROGRAM: INTRAOBSERVER AND INTEROBSERVER REPRODUCIBILITY

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Purpose: To evaluate the reproducibility of anterior chamber angle measurements using the Anterior Segment Analysis Program (ASAP) on images acquired using the anterior segment optical coherence tomography (AS-OCT).
Design: Prospective observational case series.
Participants, Methods, Outcome measures: Normal subjects underwent imaging of their nasal and temporal anterior chamber angles with an AS-OCT prototype under standardized light conditions. All images were acquired by a single operator, and each eye was imaged 3 times. The image with the best quality was chosen for analysis with a newly developed measurement software, the ASAP, which calculates angle parameters such as angle recess area (ARA) and angle opening distance (AOD), as well as anterior chamber parameters such as scleral spur-scleral spur distance (SSD), lens vault (LV) and anterior chamber depth (ACD), after the observer accurately identifies the scleral spur. The first observer (CZ) used the ASAP to measure the images 5 times on 5 different days, and a second observer used the ASAP to measure the same images independently. We calculated the intraclass coefficient (ICC) as a measure of intra- and interobserver reproducibility.
Results: The right eyes of 10 patients were analysed for intra- and interobserver reproducibility. All parameters measured by a single observer using the ASAP demonstrated excellent reproducibility (ICC 0.907-0.995) (table 1). While SSD, LV and ACD demonstrated excellent interobserver reproducibility (ICC 0.980-0.995)(table 2), ARA and AOD for both nasal and temporal angles demonstrated very good to excellent reproducibility (ICC 0.789-0.933).
Conclusions: The AS-OCT has been demonstrated previously to show good to excellent reproducibility for the acquisition of images of the nasal and temporal angle quadrants.1 However, due to the cumbersome nature of the custom analysis software (Matlab, Mathworks, Natick, MA) that was used, the amount of variability due to image processing was not previously analysed. This may have affected the overall reproducibility of measurements acquired from AS-OCT images. The ASAP is a newly developed analysis software that has been found to correlate highly with the Matlab software, but has several additional advantages to offer. The ASAP is a useful tool to be used in combination with the AS-OCT in the analysis of images of the anterior segment.
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P391 EXPERIENCE WITH THE USE OF BAERVELDT AND AHMED GLAUCOMA DRAINAGE IMPLANTS IN AN ASIAN POPULATION: LONG-TERM OUTCOMES

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Purpose: This study aims to describe the long-term outcomes in a group of patients who underwent glaucoma drainage implant surgery and received either a Baerveldt 350 mm^2 or Ahmed S2 device.
Design: This is a retrospective non-randomized review.
Participants: Twenty-eight of the original 42 patients (66.7%) were seen after 23 months.
Methods: Fifteen of the patients had received a Baerveldt 350 mm^2, and 12 had received an Ahmed S2 implant.
Main outcome measures: The efficacy and safety were assessed in terms of intraocular pressure, visual acuity and number of medications and complications. Absolute success was defined as IOP <22 mmHg without medications in the last follow-up visit. Qualified success was defined as IOP <22 mmHg with the use of anti-glaucoma medications in the last follow-up visit. Failure in IOP control was defined as > 22 mmHg on maximally tolerated medications.
Results: After a mean follow-up period of 63.19 ± 9.20 months for the Baerveldt group and 58.25 ± 15 months in the Ahmed group, there was no significant difference between the two groups in terms of IOP control, number of maintenance medications, percentage of patients maintaining or improving visual function, percentage of patients considered as successes, mean survival times and number of complications.
Conclusions: The success rates in both groups have been maintained as compared to the earlier study; and both the Baerveldt 350 mm^2 and Ahmed S2 devices have been shown to be safe and effective to use.
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12.8.3. Surgical treatment: Filterin surgery: Non-perforating

P393 CLINICAL RESULTS OF NEODYMIUM: YAG LASER GONIOPUNCTURE AFTER DEEP SCLERECTOMY.

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Objective: To observe and evaluate the intraocular pressure (IOP) lowering effect and complications of yag laser goniopuncture after non-penetrating trabeculectomy (NPTS). Design A retrospective case series study. Participants 30 patients (35 eyes) who underwent LGP after npts were included. Methods Intraocular pressure of these 35 eyes before goniopuncture were recorded. Laser goniopuncture were performed. IOP within one week and IOP at the last visit after goniopuncture were recorded. Main outcome measures Intraocular pressure and the complications. Results The mean follow-up time was 40±39 weeks, and the time between NPTS and laser was 13.0±17.1 weeks. Mean IOP before goniopunture of all 35 eyes was 19.8±8.2 mmHg. Mean IOP within one week after goniopuncture decreased significantly to 10.9±3.5 mmHg (t=6.30, p =0.000). IOP decreased by 45.0%. Among 35 eyes, there were 26 eyes which were followed up for more than 4 months. Mean IOP of these 26 eyes before goniopuncture was 19.6±8.8 mmHg, mean IOP within one week was 11.4±3.4 mmHg and IOP at last visit (mean follow up 50±38 weeks) was 15.7±3.4 mmHg separately. The IOP at these three time point were also significantly different (f=13.0, p=0.000). IOP decreased by 17.8%. Complications include iris prolapse, hypotony, and iris peripheral anterior synechia. Conclusion LGP is a safe and effective supplementary treatment for npts. It increases the successful rate of npts in terms of IOP lowering.

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P394 NON-PENETRATING VERY DEEP SCLERECTOMY WITH HYALURONIC ACID IMPLANT VS. TRABECULECTOMY-TWO YEARS OF FOLLOW- UP

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Purpose: To study and compare the efficacy and safety of non-penetrating very deep sclerectomy (NPVDS) with the use of hyaluronic acid implant (SKGEL) to trabeculectomy(TB) in patients with high risks of surgery failure.
Design: Prospective, randomized, controlled study of patients with open angle glaucoma and high risk of surgery failure was designed.
Participants and controls: Ninety-four eyes of eighty-six patients with medically uncontrolled glaucoma were randomized either to NPVDS or to the TB group of trial. There were 31 male and 55 female patients, mean age was 65,18±12,04 years. Examinations were applied before and 7days,1,3,6,18,24 months after surgery.
Methods: The procedure of NPVDS was similar to traditional npds, however, excision of sclera and exposure of ciliary body were performed, and only a narrow scleral flap was retained at a distance of 0.5mm from Schlemm's canal. Mitomycin-c 0.2 mg/ml was applied on and under the superficial flap of the sclera during NPVDS. For the TB group traditional cairns-trabeculectomy was performed with application of the mitomycin c 0,2 mg/ml on and under the superficial flap.
Main outcome measures: Intraocular pressure, number of glaucoma medications, complications.
Results: At 24 months the success rate in the NPVDS group was 95,7%, and 93,7% in the control group (p=0.670). There was no statistically significant difference between the intraocular pressure in NPVDS (14.42±3,99 mmHg) and control (15.65±3.98 mmHg) groups (p =0,38). Number of glaucoma mediations decreased from 2,14±0,51 to 0,67±0,63 in NPVDS and from 2,34±0,62 to0,54±0,55 in the TB group. Complications included four cases of hyphaema, three of choroidal detachment, two of filtering bleb fibrosis, five of cataract progression in NPVDS group, and five cases of hyphema, four of choroidal detachment, three of filtering bleb fibrosis, and ten of cataract progression in the control group.
Conclusions: (1) NPVDS is effective surgical option for patients with open angle glaucoma and high risk operation failure. (2) NPVDS is associated with smaller risk of complications, especially of cataract formation.

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P395 POSTOPERATIVE IOP IS RELATED TO INTRASCLERAL BLEB HEIGHT FOLLOWING DEEP SCLERECTOMY AND COLLAGEN IMPLANT

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Purpose: To investigate the relationship between intrascleral bleb height and intraocular pressure (IOP) following deep sclerectomy, mitomycin c and collagen implant.
Design: Case series.
Participants: Twenty eyes of 18 patients diagnosed with primary and secondary open angle glaucoma were included in the study.
Methods: Twenty eyes of 18 consecutive patients diagnosed with primary and secondary open angle glaucoma who underwent deep sclerectomy, mitomycin c and collagen implant were recruited. Anterior segment optical coherence tomography was used to evaluate the dimensions of the postoperative intrascleral blebs. Patients requiring postoperative bleb manipulations, needling or goniopunctures were excluded.
Main outcome measures: IOP and intrascleral bleb height.
Results: Mean age was 71.6 ± 13.7 years, mean time from the operation was 8.8 ± 5.1 months, and mean IOP was 13.7 ± 4.6mmHg. The mean bleb height was 0.58 ± 0.18mm and a positive correlation was found between the intraocular pressure and the height of the intrascleral filtration bleb (p= 0.018, r=0.52).
Conclusion: Our study demonstrates that intrascleral bleb height is closely related to post operative IOP. This has not previously been reported. Further studies are warranted to evaluate this relationship at different post operative time points, and possibly with different types of implants.
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P396 SCLEROTHALAMOTOMY AB INTERNO A NEW MINIMALLY INVASIVE SURGICAL OPTION FOR GLAUCOMA, 4 YEARS OF FOLLOW-UP
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Purpose: The aim of this study is to demonstrate the efficacy and safety of a new surgical procedure termed sclerothalamotomy ab interno (STT ab interno) for the treatment of primary open-angle glaucoma and juvenile glaucoma.
Design: Prospective study.
Participants: Fifty-eight non-penetrating glaucoma procedures called 'sclerothalamotomies ab interno' were performed with radiofrequency in 53 patients with primary open-angle glaucoma and 5 patients with juvenile glaucoma between April 2002 and June 2003. The average preoperative intraocular pressure (IOP) in the 53 primary open-angle glaucoma respectively 5 juvenile glaucoma patients was 25.6 ± 2.3 mmHg respectively 41.0 ± 6.4 mmHg.
Methods: The sclerothalamotomies ab interno were carried out with a custom made high-frequency dissection 19g probe (tip 0.3x1 mm) applying bipolar current with a frequency of 500 khz.
Main outcome measure: After a follow-up period of 48 months, the average IOP dropped to 14.6 ± 1.7 mmHg respectively to 12.0 ± 2.6 mmHg, an outcome which is in both groups statistically ($p<0.005$) highly significant.
Results: Transient IOP elevation was observed in 12 eyes (22.6%) of primary open-angle glaucoma and no case in juvenile glaucoma. In all cases, these IOP spikes were controlled by a temporary re-institution of topical glaucoma medical therapy. There were no serious complications related to the procedure.
Conclusion: Sclerothalamotomy ab interno is a minimally invasive, safe and efficacious surgical technique for lowering IOP in open-angle and juvenile glaucoma.
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P397 SHORTENING THE LEARNING CURVE OF DEEP SCLERECTOMY: THE XIV COMMANDMENTS
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Introduction: One of the major disadvantages of deep sclerectomy is its associated long learning curve.
Aim: This pictorial poster aims at providing 14 easy to do recommendations for shortening the learning curve of deep sclerectomy.
Methods: In a step-by-step manner and with the aid of high-resolution images, this poster is going to provide clear recommendations that aid in clarifying and facilitating the learning process.
Results: The following steps are discussed; exposing the surgical site via corneal traction sutures, inverted L-shaped periotomy, size of superficial flap, depth of superficial flap, size and depth of deep flap, stretch dissection of deep flap, virtual line of dissection, opening Schlemms canal, detach-

ing the descemets membrane, advancing anteriorly, excising the deep flap, filling the intrascleral space, suturing the flap, and suturing the conjunctiva.
Conclusion: Following precise and easy to achieve recommendations could shorten the learning curve.

P398 SCLERA-PRESERVING VISCOCANALOSTOMY
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Purpose: To describe and evaluate a modified viscocanalostomy.
Design: A prospective, interventional initial case series.
Participants: Eleven eyes with various types of glaucoma were included.
Methods: After superficial scleral flap dissection, the trabeculotome is placed inside Schlemm's canal (SC) through a vertical limbal incision. A direct horizontal incision is made over the visible trabeculotome to incise Schlemm's canal roof. Dissection of the second flap is then completed and excised, without removing deep sclera tissue.
Main outcome measures: Intraocualr pressure control.
Results: The mean age of the patients was 51.6 ± 10.6 years, the mean preoperative IOP was 29. 45 ± 8.3 mmHg, under a mean of 2.6 ± 0.67 anti-glaucoma therapy. The mean follow up period was 7.4 months. The mean IOP at the conclusion of the follow up period was 10.6 ± 4.5 mmHg, with a mean antiglaucoma therapy of 0.18 ± 0.4.
Conclusion: Viscocanalostomy without excision of deep sclera is a promising modification of the original surgery.
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P399 EFFICACY AND SAFETY OF DEEP SCLERECTOMY AND FACODEEPSCLERECTOMY IN CLINICAL MATERIAL OF THE MILITARY HEALTH SERVICE INSTITUTE-YEARLY OBSERVATIONS
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Purpose: Comparison of the effectiveness of nonpenetrated deep sclerectomy (DS) as the only procedure in relation to operation combined with facoemulsification (FDS) in treatment of patients with open-angle glaucoma based on yearly observation.
Materials and Methods: Sixty-seven eyes with open-angle glaucoma were retrospectively analyzed. Applying layer-systematic criteria 21 eyes after deep sclerectomy with scleral implant (skgel/corneal or t-flux/i-tech) were selected into group I (DS implant) and 23 eyes after facoemulsification with simultaneously performed deep sclerectomy and scleral implants were selected into group II (FDS implant). In control studies best corected visual acuity (BCVA), intraocular pressure (IOP), anterior chamber and fundus were examined, postoperative complications and applied procedures were analyzed especially controlling hypotensive effect (goniopuncture, antimetabolites), as well as number of glaucoma medications used. Tests were performed in 1 and 7 days after surgery, and later after 1, 3, 6, 12 months. Statistically, the test u Mann-Whitney was used as well as the pair sequence Wilcoxon test. Survival analysis was done with the Kaplan-Meier method with the use of log rank test.
Results: After 360 days of observation mean values of IOP in group I was 14.3 ± 3.6 mmHg, and in group II 12.9 ± 3.0 mmHg. It was a decrease of mean IOP by 29.6% (p=.000) and 41.4% (p=.000) in comparison to preoperative IOP in particular groups. In both groups fewer glaucoma medications were used after surgery and the results were statistically significant (p<.05). Complete success rate was considered an IOP of ≤ 18 mmHg without glaucoma medications, and qualified success rate was an IOP of ≤ 18 mmhg without medications or with the most of two glaucoma medications. Complete and qualified success rates were achieved respectively in group I (72.6% and 88.4%) and in group II (74.3% and 86.9%) at the end of observation. In the entire observation there were no statistically significant differences between group I and II (p>.05). After 360 days of observation there was no statistically significant difference between mean BCVA between group I and II (p>.05).
Conclusions: DS with scleral implant performed as a single procedure or FDS is effective treatment in open-angle glaucoma.
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P400 THE EFFECTIVENESS OF DEEP SCLERECTOMY PERFORMED SIMULTANEOUSLY WITH PHACOEMULSIFICATION WITH IMPLANTATION INTO SCLERAL BED SK-GEL AND T-FLUX- 12 MONTHS OBSERVATION
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Purpose: T*he purpose of this work was to present effectiveness and safety of phacodeepsclerectomy with absorbable implant of sodium hialuronate (sk-gel/corneal) or non-absorbable acrylic implant (t-flux/iol tech).
Materials and methods: Retrospective analysis included

two groups of patients after phacoemulsification and deep sclerectomy. Group I (sk-gel) consisted of 36 patients (40 eyes) with implantation sk-gel into scleral bed 23 patients (23 eyes) qualified into group II (t-flux) in who implanted t-flux. At the control studies BCVA, IOP, anterior and posterior segment of the eye were examined. Control testing was done in day 1 and 7 after surgery and later after 1, 3, 6 and 12 months. Complete success rate was defined as IOP ≤18 mmhg without medications and qualified success rate as IOP ≤18 mmhg without and with medications. In statistical analysis u Mann-Whitney's test, t-student's test, pair sequence Wilcoxon's test were used as well as variance analysis (one-way anova) and chi square test. Survival analysis was done with Kaplan-Meier method with the use of log rank test.
Results: After 360 days of observation the mean value of IOP in the sk-gel group was 12.7 ± 0.6 (se) mmHg and in t-flux group 14.6 ± 0.7 (SE) mmHg. It was a decrease in the mean IOP by 39.1% (p=.000) and 35.7% (p=.000) respectively to the values before surgery in particular groups. In both groups fewer medications were used than before surgery and the results were statistically significant (p<.05). Complete surgical success rate and qualified success rate was reached respectively in group I (81.7% and 91.9%) and in group II (72.7% and 83.8%) at the end of observation. In the entire observation period there was no statistically significant difference between groups I and II (p>0.05). Goniopuncture with laser nd:yag performed in 16 eyes; included 10 eyes with implant sk-gel (25.0%) and 6 eyes with implant t-flux (26.1%) (p>.05). Subconjunctival injections with 5-fu were done in 5 eyes in the sk-gel group (12.5%) and in 3 eyes in the t-flux group (13.0%) (p>.05). There was no statistically significant difference between character and quantity of complications in studied groups of eyes.
Conclusions: Deep sclerectomy with absorbable implant sk-gel or non-absorbable implant t-flux are both effective and safe surgical methods in the treatment of open-angle glaucoma with cataracts operated with phacosclerectomy method.
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12.8.10. Surgical treatment: Filtering surgery: Woundhealing antifibrosis

P402 INTRAVITREAL BEVACIZUMAB FOR FILTERING SURGERY

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Purpose: To report on the intravitreal use of bevacizumab as anti-proliferative agent in combination with filtering surgery.
Design: Clinical interventional case-series.
Methods: The study included 2 patients (2 eyes) who underwent standard antiglaucomatous penetrating filtering surgery combined with an intravitreal application of 1.5 mg bevacizumab. The intraocular pressure was elevated due to an intravitreal triamcinolone injection as treatment of exudative age-related macular degeneration (patient # 1) or due to neovascular glaucoma (patient # 2) after an ischemic retinal branch vein occlusion.
Results: At 4 and 12 weeks after surgery, respectively, intraocular pressure was reduced in both patients to 10 mmHg and 14 mmHg with functioning filtering blebs.
Conclusions: Intravitreal bevacizumab may potentially be helpful as addition to antiglaucomatous filtering surgery, particularly in neovascular glaucoma.
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P403 PRIMARY TRABECULECTOMY WITH MITOMYCIN C IN ADVANCED GLAUCOMA

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Purpose: To evaluate clinical outcomes of trabeculectomy with low dose mitomycin in phakic eyes with advanced glaucoma.
Design: Retrospective noncomparative interventional case series.
Patients and Methods: 54 eyes from 50 patients with advanced POAG, PACG, pseudoexfoliative glaucoma, and low tension glaucoma who underwent standard trabeculectomy with low dose (0.2 mg for 2 minutes) weck-cell soaked mitomycin and releasable suture between March 2002 until December 2006 included. Clinical outcome measures including postoperative IOP, change in logmar VA, incidence of complications, number of medication after surgery in last follow up. Two level of success defined: IOP<18 mmHg and IOP<15 mmHg + medication in last follow up.
Results: Fifty-four eyes from 50 patients with average age of 59.83±15.4 who underwent trabeculectomy were evaluated. Patients had 13.74±11.74 months mean follow-up (range from 2-57 months). For 10 patients (18.6%) 5-fu injection was done in first month after surgery. Mean IOP decreased from 28.78±8.6 to 13.04±4.58 in last follow-up (p< 0.000 with paired t test). In 84.6% IOP level was <18

mmHg and in 63.5% IOP was <15 mmHg in last follow-up. Logmar VA was unchanged in 56.5%, increased in 26.1% and decreased in 17.4%. Mean number of medications decreased from 2.82±0.691 preoperative to 0.58+0.69 in last follow-up (p<0.000 with paired t test). The most common complication were thin bleb in 6 patients (11.11%), shallow AC with choroidal detachment in 4 patients (7.4%) that only in one patients needed drainage. Progression of cataract that need for further cataract surgery in 4 patients (7.4%), persistant hypotonia (IOP<6 mmHg) in 2 patients (3.7%) without maculopathy.
Conclusions: Primary trabeculectomy with low dose mitomycin and releasable sutures is an effective method for control of IOP in phakic patients with advanced glaucoma.
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P404 TRABECULECTOMY AND VISCOCANALOSTOMY WITH OCULUSGEN IMPLANT: SHORT TERM RESULTS

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Purpose: To evaluate the results of patients who had trabeculectomy, viscocanalostomy or phacoviscocanalostomy with oculusgen collagen matrix implant.
Design: Prospective, noncomparative, surgical case series.
Participants: Seventeen eyes of 16 patients that underwent trabeculectomy, viscocanalostomy or phacoviscocanalostomy with oculusgen implant between may 2006 and december 2006 were included in the study.
Intervention: In all cases oculusgen was implanted on the top of the scleral flap within the subconjunctival space before suturing the conjunctiva. Mitomycin c was also applied to the sclera in some eyes.
Main outcome measures: Diagnosis of glaucoma, intraocular pressure levels, the number of antiglaucoma medications and complications were evaluated.
Results: The mean age was 32.13 ± 24.44 years (range, 3-79 years), mean follow-up time was 4.06 ± 2.44 months (range, 1-8 months). Diagnoses included primary open angle glaucoma in 3 eyes, silicone oil-related glaucoma in 2 eyes, pseudoexfoliation glaucoma in 2 eyes, aphakic glaucoma in 2 eyes, juvenile glaucoma in 2 eyes, chronic angle closure glaucoma in 2 eyes, postkeratoplasty glaucoma in one eye, steroid-induced glaucoma in one eye, congenital glaucoma in one eye and neovascular glaucoma in one eye. Fifteen eyes had trabeculectomy, one eye had viscocanalostomy and one eye had phacoviscocanalostomy. The mean preoperative IOP was 27.82±7.81 mmHg, the final IOP was 18.06 ± 9.38 mmHg. Mean final IOP level was significantly lower than mean preoperative IOP level (p=0.005). The mean number of preoperative antiglaucoma medications was 3.18 ± 1.07 and the final number was 1.35 ± 1.73; the difference was significant (p=0.003). Postoperative complications included choroidal detachment in three eyes, filamentary keratitis in two eyes and hyphema in two eyes.
Conclusions: Trabeculectomy, viscocanalostomy and phacoviscocanalostomy with oculusgen implant lowers IOP effectively and safely. But longer follow-up is necessary to confirm these results.

P405 MECHANISM OF INTERFERONS REGULATED FAS MEDIATED APOPTOSIS IN MITOMYCIN-C RESISTANT HUMAN TENONS FIBROBLASTS

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Purpose: Tenon's fibroblasts are the key players in subconjunctival scarring. Mitomycin-c induces fibroblast death by apoptosis and inhibits scar formation Resistance to mitomycin-c has been reported to correlate with failure of mitomycon-c trabeculectomies. Interferon induces apoptosis in a number of cell types. We have previously reported that interferon-alpha and-gamma prime mitomycin-resistant human Tenon's fibroblasts (HTF) to FAS induced apoptosis. To understand the mechanism of this effect, we investigated the expression of FAS-related proteins and caspase activities in interferon-alpha and-gamma pretreated HTF.
Methods: A mitomycin-resistant primary HTF cell line was generated from Tenon's biopsy. Cells were pretreated with interferon-alpha (5,000u) and interferon-gamma (100u) for 48 hours prior to exposure to agonistic fas antibody ch11 (50ng/ml) for 2 days. Cell death was determined by morphology and lactate dehydrogenase release assay. FAS and FAS-ligand expression were analyzed by flow cytometry. FADD, caspase-8 and caspase-3 were detected by western blot.
Results: Forty-eight hour interferon-alpha or interferon-gamma pretreatment increased expression of FAS receptor, FADD and caspase-8. Expression was further increased by interferon-alpha andgamma in combination. Interferon pretreatment had no effect on FAS-ligand or capsase-3 expression. Incubation with ch11 for 2 days induced 16% apoptosis in non-pretreated cells ($p < 0.01$ vs control). Interferon-alpha alone had no effect on ch11-induced apoptosis. But ch11-induced apoptosis was increased to 31% by interferon-gamma pretreatment and 55% by combined interferon-alpha andgamma pretreatment. Antagonistic anti-FAS antibody zb4 completely blocked ch11-induced apoptosis. Application of inhibitors specific for caspase-8, caspase-3 or a broad caspase inhibited ch11-induced apoptosis in interferon-pretreated HTF in a dose dependent manner.
Conclusions: Interferon-alpha andgamma render mitomycin-resistant cells sensitive to FAS-mediated apoptosis. The mechanism involves increase of disc formation by upregulation of FAS, FADD and caspase-8 expression.

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P406 SURGICAL OUTCOME OF INTRAVITREAL BEVACIZUMAB INJECTION AND TRABECULECTOMY WITH MITOMYCIN C FOR THE TREATMENT OF NEOVASCULAR GLAUCOMA

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Objective: To evaluate the surgical outcome of trabeculectomy with mitomycin c (MMC) in neovascular glaucoma after an adjunctive treatment with intravitreal bevacizumab (Avastin) injection.
Design: Prospective interventional case series.
Participants: Four patients with neovascular glaucoma presented at the department of ophthalmology, faculty of medicine siriraj hospital, Mahidol University, Thailand. All patients had undergone an adequate panretinal photocoagulation (PRP) yet persisted neovascularization at the iris (NVI).
Methods: After adequate PRP with maximal anti-glaucoma medication therapy, 4 patients with neovascular glaucoma underwent intravitreal bevacizumab (1.25 mg in 0.05 ml) injection after discussion about the risks and benefits and signing the comprehensive informed consent. Four weeks later, the patients received a fornix-based conjunctival flap trabeculectomy with intraoperative MMC. The appointments for follow-up were at 1 day, 1 week and every 4 weeks period after the operation.
Main outcome: The visual acuity, intraocular pressure (IOP), number of anti-glaucoma medication and iris photography for NVI were compared between before and after trabeculectomy. The intraoperative and postoperative complications were recorded.
Results: There were 2 males and 2 females with the mean age of 60.5 years enrolled into the study. Two patients had proliferative diabetic retinopathy and the remaining 2 patients had retinal vascular occlusion. The absolute regression of NVI was observed within 1 week after intravitreal bevacizumab injection in 3 patients. One patient experienced the reduction of NVI but NVI still persisted till after trabeculectomy. Mean IOP was reduced from 38.5 mmHg (range 33-42) preoperatively to 7.2 mmHg (range 2-12) on the 1st postoperative day. No intraoperative complication was noted. Two patients had postoperative hyphema, which resolved spontaneously within 1 week. During the mean follow-up of 9 weeks (range 5-14), 3 patients had a good controlled IOP (range 2-18 mmHg) without any anti-glaucoma medication. The visual acuity was unchanged in 1 patient, improved in 1 patient and lost preoperative light perception in 1 patient. The remaining 1 patient had a good IOP control until at last visit when the recurrent NVI was detected subsequently uncontrolled IOP. The patient underwent diode laser cyclophotocoagulation and lost visual acuity at last visit (14 weeks).
Conclusion: Intravitreal bevacizumab injection is an effective modality to reduce intraoperative complications during trabeculectomy for neovascular glaucoma. The short-term outcome after trabeculectomy with MMC is favourable. A long term follow-up should be conducted to determine the long term outcome.

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P407 TRANSCONJUNCTIVAL PENETRATION OF MITOMYCIN-C FOLLOWING SUPRA-CONJUNCTIVAL APPLICATION DURING ROUTINE TRABECULECTOMY

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Objective: Estimation of mitomycin-c concentration in the Tenon's capsule following application over intact conjunctiva before routine trabeculectomy.
Design: Observational case series.
Participants: Forty-one eyes of 41 patients were included.
Materials and Methods: All patients were scheduled for standard trabeculectomy (as described by Cairns) for not achieving target intra-ocular pressure (IOP) on maximum tolerable medical therapy. Merocel sponge soaked with freshly prepared 0.4 mg/ml of mitomycin-c were placed directly over intact bulbar conjunctiva at proposed site of trabeculectomy for 3 minutes. A thorough wash with 10 ml of ringer lactate was done. Superior rectus bridle suture was then passed, 8-10 mm high limbus based flap was raised, and a part of tenon's capsule directly beneath the site of application was excised. Tenon's was homogenized, centrifuged and MMC concentrations were analyzed using high-performance liquid chromatography (HPLC).
Main outcome measures: Estimation of mitomycin-c concentration in Tenon's using HPLC.
Results: The mean age was 45.63±18.27 years (range 3 to 77). Mean pre-operative IOP 39.49±1.2 mmHg. Of 41 patients, 21 had chronic primary angle closure glaucoma, 9 had primary angle closure glaucoma, 20 had other forms of glaucoma (congenital, angle recession, secondary, Axenfeld Riegers anomaly, neovascular glaucoma, etc.).The av-

erage weight of the sample of tenon's tissue excised was 5.51± 4.42 mg (range 0.9-17.1) and the average estimated MMC concentration found to be present in the Tenon's using hplc was 18.67±32.36 x 10-6 m (range 0.38 ' 197.05 x 106 m). In 36 of the 41 patients (87.80%) the MMC concentration reached above 2 x 10-6 m (concentration required to inhibit human conjunctival fibroblasts.)

Conclusion: Mitomycin permeates into subconjunctival tissue after supraconjunctival application in concentration enough to inhibit human conjunctival fibroblasts in most of the cases. Application of MMC over the conjunctiva may be a useful alternative to sub-conjunctival or sub-scleral application during routine trabeculectomy and as an adjunct during needling of failing blebs.

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P408 CLINICAL EXPERIENCE WITH BIODEGRADABLE 3D-POROUS COLLAGEN-GLYCOSAMINOGLYCAN SCAFFOLD (OCULUSGEN) FOR TREATMENT OF REFRACTORY GLAUCOMA

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Purpose: Subconjunctival scarring is the major cause of filtering surgery failure, despite evolution and modification of its technique. The application of three-dimensional collagen-glycosaminoglycan copolymers (oculusgen) can lead to random and relatively loose reorganization of regenerating myofibroblasts, fibroblasts and the secreted extracellular matrix, resulting in reduced scar formation. We hypothesized that subconjunctival implantation of oculusgen could increase the success rate of filtering surgery and we conduct a short-term pilot study that evaluates the safety and efficacy of trabeculectomy with implantation of oculusgen in refractory glaucoma patients.

Design: Prospective and non-randomized study.

Participants: 82 refractory glaucoma patients (m:45, f:37, age: 59.9 ±13.4 yrs) which is defined as having previously failed medical, laser or surgical treatment, or some combination thereof.

Methods: All patients underwent trabeculectomy with new device in one eye and the oculusgen was implanted on the top of the scleral flap at the limbus before closing the conjunctival wound during operations.

Main outcome measures: Intraocular pressure (IOP), number of medications and complication were assessed before and after surgery.

Results: The mean preoperative IOP was 44.2±16.5 mmHg with 2.6±0.7 antiglaucoma medications. Postoperatively, the mean IOP at last follow up (9 months) for all eyes was 14.1±4 mmHg (68.1% reduction, $p < 0.01$) with 0.6±0.5 antiglaucoma 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: The preliminary results of this study indicate that the oculusgen implantation in trabeculectomy represents a new, safe, simple and effective therapeutic approach for treating refractory glaucoma. A larger-scale study with a longer follow-up period is required to confirm these observation.

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P409 THE EFFECTIVENESS AND SAFETY OF OCULUSGEN COLLAGEN MATRIX IMPLANTED IN GLAUCOMA PATIENTS DURING FILTERING SURGERY

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Purpose: To evaluate the validity of the oculusgen collagen matrix grafted in the subconjunctiva space of glaucoma patients and to observe its side effect.

Method: The protocol for the study was approved by the ethics committee of our hospital. Informed consent was obtained from all patients participating in this study. There are 21 glaucoma patients(30 eyes) who are implanted the oculusgen collagen matrix during the glaucoma filtration surgery and postoperatively examined 90 days.

Result: At 90 days postopratively, the IOP of test group is significantly lower than the control group ($p<0.05$).the successful rate of test group is 90%.the test group occurred less complication than the control group.

Conclusion: Oour findings demonstrate that oculusgen collagen matrix can effectly reduce the IOP after the glaucoma filtration surgery with less complication.

P410 RELATIONSHIP BETWEEN FUNCTION AND ULTRASOUND BIOMICROSCOPIC IMAGES OF FILTERING BLEBS AFTER AMNIOTIC MEMBRANE-ASSISTED TRABECULECTOMY

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Purpose: To investigate the relationship between function and ultrasound biomicroscopy (UBM) images of filtering blebs after amniotic membrane (AM)-assisted trabeculectomy.
Design: Cohort study.
Participants: Twenty nine eyes of 27 consecutive patients, who had undergone AM-assisted trabeculectomy for refractory glaucoma for 6 months or more.
Methods: Postoperative control was defined as good if intraocular pressure (IOP) was 21 mmHg or less without topical hypotensives, fair if IOP was 21 mmHg or less with topical hypotensives, or poor if IOP was over 21 mmHg with topical hypotensives and oral carbonic anhydrase use or additional surgeries were required. UBM probe (Tomey) was used to examine bleb morphology. Relationship between the postoperative IOP control and the following UBM parameters was analyzed, which were intrableb reflectivity (high vs. low), visibility of the route of the scleral flap (visible or invisible), bleb height, fluid-filled space height, and the ratio of fluid-filled space height to bleb height. Chi-squared test or one-factor analysis of variance with Fisher's protected least significant difference as a post hoc test was used for statistical comparisons.
Results: Mean age ± standard deviation (sd) was 56.3 ± 19.5 years. The mean duration between surgery and UBM analysis was 18.6 ± 8.0 months, ranging from 6 to 33. The number of prior surgeries was 2.8 ± 1.4, raging from 1 to 7. The postoperative IOP control was good in 14 eyes, fair in 9, and poor in 6. The intrableb reflectivity was not different among three IOP control groups (p=0.253), whereas the good control group had the significantly more number of the blebs with the visible route under the scleral flap than the fair or poor control group (p<0.05). There was no significant difference in bleb height and fluid-filled space height among three groups, while the ratio of fluid-filled space height to bleb height in the good control group (=0.96 ± 0.63) was significantly bigger than that in the poor control group (=0.33 ± 0.34) (p=0.0125). On the contrary to the previous reports of trabeculectomy without AM and non-penetrating trabeculectomy, most of the blebs (=83%) presented high reflectivity irrespective of postoperative IOP controls.
Conclusions: The visibility of the route underneath scleral flap and the relative height of fluid-filled space to the bleb height were highly associated with postoperative IOP controls following the AM-assisted trabeculectomy.
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P411 RESULTS OF FILTERING SURGERY WITH DIFFERING DOSES OF INTRACAMERAL BEVACIZUMAB FOR NEOVASCULAR GLAUCOMA

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Purpose: To evaluate the effect of 1mg and 2 mg intracameral bevacizumab on regression of neovascularisation of iris (NVI) and surgical outcomes of filtering surgery in eyes with neovascular glaucoma.
Design: Prospective interventional case series.
Materials and Methods: 11 eyes previously treated with laser or anterior retinal cryopexy with persistent NVI and raised IOP were randomly assigned to receive 1 mg (group 1) or 2 mg (group 2) intracameral bevacizumab. Trabeculectomy with mitomycin c was performed if IOP was uncontrolled on maximum tolerable medical therapy. Anterior segment photographs at each follow up were taken by an observer masked to the patient groups.
Main outcome measures: To evaluate the effect on NVI regression and IOP control after trabeculectomy between the 2 groups.
Results: Mean baseline IOP in group 1 (36.6+12.5 mmHg) was not significantly different from group 2 (31.8±6.7 mmHg) (p=0.2).reappearance of NVI occurred in one of the 5 eyes in group 1 after 1 month of intracameral injection while it occurred in none of the 6 eyes in group 2. After trabeculectomy with MMC the mean IOP between the 2 groups at 8 weeks post operative follow up was not significantly different; group 1 = 14±4 mmHg, group 2 = 11.5±2 mmHg (p=0.3).
Conclusion: A dose of 2 mg is safe but with similar efficacy as 1 mg intracameral bevacizumab for neovascular glaucoma, however longer follow up after trabeculectomy would be needed to evaluate the status of iris neovascularisation and IOP control.
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P412 EFFICACY AND COMPLICATIONS OF FORNIX-BASED TRABECULECTOMY WITH MITOMYCIN C IN NORMAL-TENSION GLAUCOMA

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Purpose: To evaluate the efficacy and complications of fornix-based trabeculectomy with mitomycin c (MMC) in normal-tension glaucoma (NTG) patients.
Methods: Clinical records of NTG patients who underwent fornix-based trabeculectomy with 0.04% MMC and had been follow-up over 3 years were retrospectively reviewed. Twen-

ty-three eyes of 16 patients were enrolled, and mean follow-up period was1305±498 days. Postoperative intraocular pressure (IOP), postoperative complications, visual acuity, and visual field were evaluated.
Results: IOP significantly decreased from 16.5 ± 1.9 preoperatively to 9.1-11.8 mmHg throughout the postoperative follow-up period ($p < 0.001$). Cumulative survival rate of 30% and 20% IOP reduction were 47.4% and 66.7%, respectively, at 3 years after surgery. Postoperative complications observed were choroidal detachment (1 eye), hypotonous maculopathy (3 eyes), bleb leak (2 eyes), cataract development (1 eye), aftercataract (1 eye). No eyes developed endophthalmitis). Cumulative survival rate of decreasing md 3db was 85.7% at 3 years.
Conclusions: In NTG patients, fornix-based trabeculectomy with MMC shows significant efficacy in reducing IOP over 3 years after surgery. However, visual field deteriorates in some cases.
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P413 INTRAVITREAL BEVACIZUMAB AS AN ADJUNCT FOR REFRACTORY NEOVASCULAR GLAUCOMA SURGERY

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Purpose: To present a series of neovascular glaucoma (NVG) cases that were treated with injection of intravitreal bevacizumab, followed by combined pars plana vitrectomy (PPV) and panretinal photocoagulation (PRP) with trabeculectomy assisted by mitomycin c.
Design: Retrospective interventional case series.
Participants: Four eyes of three patients (two men and one woman, mean age, 62.3 ± 3.8 years) with NVG and refractory intraocular pressure (IOP) elevation were included. More than three-quarter of the anterior chamber angle were occluded in all cases.
Intervention: Patients had injections of intravitreal bevacizumab (1mg) before surgery, followed by combined PPV and PRP with trabeculectomy assisted by mitomycin c.
Main outcome measures: Visual acuity, iris neovascularization, intraoperative and postoperative hyphema and IOP.
Results: The mean follow-up period was 3.7 months (range 3-4 months). Visual acuity remained stable or improved in all cases. Iris neovascularization was obviously decreased after the injection of bevacizumab. IOP decreased significantly from 34.5 ± 6.0 mmHg preoperatively to 13.0 ± 6.8 mmHg at the final visit ($p<0.001$). Postoperative hyphema was observed in only one case and was resolved after re-injection of intravitreal bevacizumab (see figures).
Conclusion: Injection of intravitreal bevacizumab, followed by combined PPV and PRP with trabeculectomy with mitomycin c, effectively retained visual acuity and reduced IOP. Intravitreal bevacizumab appears to be a useful adjunct for the management of refractory NVG.
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P414 FIRST EXPERIENCES WITH THE OCULUSGENTM COLLAGEN-MATRIX-IMPLANT IN GLAUCOMA SURGERY

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Purpose: Scarring in the filtration area is the major limiting factor for the success of penetrating glaucoma operations. The modulation of wound healing with toxic agents, e.g., 5-fluorouracil or mitomycin-c, promotes success, but increases the rate of severe complications. An alternative could be an implantation of a biodegradable, porous collagen-matrix into the subconjunctival space, providing a physiologic regeneration of tenon and conjunctiva.
Design: Non-randomised clinical trial.
Participants: Ten eyes of 10 patients in the age of 64.7 ± 10.8 years with chronic open angle glaucoma and increased risk of wound healing and conjunctival scar formation.
Intervention: A standard trabeculectomy was performed with use of the oculusgen collagen-matrix-implant.
Main outcome measures: IOP, number of antiglaucomatous drugs.
Results: Intra-operatively no complications occurred. The IOP decreased from 29.3 ± 6.7 mmHg with 3.3 ± 0.5 an-

tiglaucomatous drugs to 13.7 ± 4.4 mmHg without topical treatment after one month and to 15.4 ± 3.3 mmHg after three months. In two cases, surgical intervention was necessary due to ocular hypotony. Formation of Tenon-cysts with increased IOP was found in three cases after 3-4 weeks and was treated with needling with 5-fu-injection. In one case repeated operations were necessary, including trabeculectomy with mitomycin-c and cyclophotocoagultion.
Conclusions: Early postoperative results of patients after trabeculectomy without mitomycin-c and using a collagen-matrix-implant, are promising. An intensive postoperative care is still necessary.
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12.8.11. Surgical treatment: Filtering surgery: Complications, endophthalmitis

P415 RATE OF BLEBITIS/LATE ONSET ENDOPHTHALMITIS POST GLAUCOMA FILTRATION SURGERY

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Objective: The reported rate of blebitis/endophthalmitis is 1-6% at 2-6 years post filtration surgery. Our objective was to study the rate and risk factors of blebitis/endophthalmitis 5-10 years post filtration surgery.
Design: Retrospective review of consecutive patients undergoing filtration surgery by one surgeon from January 1, 1996 to December 31, 2001.
Participants: Four hundred fifty-five eyes of 350 patients.
Methods: Chart review.
Main outcome measures: Data recorded patient demographics, glaucoma type, procedure details, use of antimetabolites, bleb leaks and manipulations, visual acuity, intraocular pressure and functionality of the bleb post infection.
Results: During the study period 455 eyes of 350 patients (43.6% males and 56.4% females) underwent 522 surgeries. 71.5% were caucasian and 11.1% black. 40% had primary open angle glaucoma and 24% were diabetic. Mean age at surgery was 65.2 years (16.9-90.6). Mean follow-up time was 5.33 years (range, 3 days-10.7 years). Mitomycin c was used in 52% cases. For all surgeries 30.1% underwent suture lysis, 5.2% of blebs developed leak and 1.72% underwent bleb repairs. There were 1.3% bleb related infections, 4 blebitis and 1 endophthalmitis, occurring 3 weeks to 78 months post surgery (mean 31.3 months). There were 3 males and 2 females, with a mean age at surgery of 53.4 years (27-80); 3 were black and 2 caucasian; 3 had primary open angle glaucoma, 1 low tension and 1 mixed mechanism glaucoma; 2 had had multiple surgeries. All 5 underwent trabeculectomies with a superior fornix based conjunctival flap. Mitomycin c was used in 4/5. Pre-infection, 4 underwent suture lysis; bleb leaks were seen in 4; 3 underwent surgical revision; and 1 autologous blood injection. 2 had hypotony before and after the infection. Vision dropped in 1 after infection. The bleb remained functional in 3 after infection. Treatment included intravitreal antibiotics and fortified antibiotic drops and in one case a vitrectomy.
Conclusion: We found 5 (1.3%) cases of bleb infections in 522 filtration surgeries with a maximum of 10.8 years follow-up. Black race, antimetabolites, bleb manipulation, multiple surgeries, bleb leaks and hypotony were important risk factors. Diabetes mellitus was not an important risk factor.
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P416 INCIDENCE AND RISK FACTORS OF LATE-ONSET BLEB-RELATED INFECTION FOLLOWING TRABECULECTOMY

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Purpose: To determine the incidence and risk factors of bleb-related infection following trabeculectomy.
Methods: A retrospective chart review of all cases who underwent trabeculectomy or trabeculectomy combined with cataract surgery, with or without antifibrotic agents from january 1, 1985, through december 31, 2005 at our hospital was performed. The Kaplan-Meier survival method was used to estimate incidence of late-onset bleb-related infection including blebitis and endophthalmitis. Cox regression analysis was performed using sex, age, present of diabetes mellitus and/or systemic hypertension, laterality, type of glaucoma, number of previous incisional operations, preoperative lens status (i.e., phakia, aphakia, or pseudophakia), trabeculectomy performed without concurrent cataract surgery, use of adjunctive antibiotics (i.e., Mitomycin-c and 5-fluorouracil), filtering bleb location, presence of bleb leak, continuous use of antibiotics or steroid, and additional bleb needling procedure, to identify risk factors.
Results: A total of 2115 cases of 1348 patients were included in the study. The average follow-up was 5.0 years. Fifty-five eyes (2.6 %) experienced an episode of bleb-related infection. Bleb leak was observed in 18.3% (388

cases). The cumulative incidence of bleb-related infection was 7.8 % at 12 years. Risk factors for bleb-related infection included presence of bleb leak (p<0.0001), younger age (p=0.02), presence of diabetes mellitus (p=0.02), and continuous use of antibiotics (p=0.03).
Conclusions: Bleb leakage is a significant risk factor for late-onset bleb-related infection. Continuous use of antibiotics after surgery may increase risk for infection.

P417 BLEB-RELATED INFECTIONS AFTER TRABECULECUTOMY WITH MITOMYCIN C: LIMBUS-BASED VERSUS FORNIX-BASED CONJUNCTIVAL FLAP
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Purpose: To compare the incidences of bleb-related infections after limbus-based conjunctival flap and fornix-based conjunctival flap for trabeculectomy with mitomycin c (MMC).
Design: Retrospective nonrandomized comparative interventional case series.
Participants: One thousand one hundred eighty seven eyes.
Methods: We retrospectively reviewed the records of 1187 consecutive trabeculectomies with MMC performed at the Osaka Koseinenkin hospital from 1995 to 2002. Limbus-based trabeculectomy was performed until January 2000, and then, fornix-based trabeculectomy was performed.
Main outcome measures: The incidence of bleb-related infections, the 5-year probability of developing bleb-related infections.
Results: The overall incidence of bleb-related infections was 1.6% (19 eyes of 1187) with the mean follow-up period of 1188 ± 40 days (range: 90-3974 days). Bleb-related infections developed in 2.3% of patients (17 of 727) with limbus-based trabeculectomy and in 0.4% (2 of 460) with fornix-based trabeculectomy. The 5-year probability of developing bleb-related infections of limbus-based trabeculectomy was 3.8%, which was significantly higher than that of fornix-based trabeculectomy (0.4%) (p= 0.034, log-rank test).
Conclusions: Fornix-based trabeculectomy significantly decreases the risk of bleb-related infection compared to limbus-based trabeculectomy.
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P418 REVISION OF OVERFILTERING BLEBS FOLLOWING TRABECULECTOMY WITH MITOMYCIN C USING SCLERAL PATCH GRAFTS
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Objective: To determine visual outcome, intraocular pressure (IOP) control and complications of scleral patch grafting (SPG) for overfiltering blebs following trabeculectomy with intraoperative application of mitomycin c.
Design: Case series: chart review of all patients undergoing SPG for overfiltering blebs between September 1, 2004 and August 31, 2006
Participants: Eight eyes of 7 patients were included.
Intervention: Revision of an overfiltering bleb using SPG was the intervention studied. All operations were performed by a single surgeon (AB). Surgery involved exposure of the trabeculectomy site with a fornix based conjuctivo-Tenon's flap, excision of avascular conjunctiva, Tenon's cysts, or necrotic sclera and application of a partial thickness donor scleral flap sutured all round with interrupted 10-0 monofilament nylon sutures. The conjunctiva was then advanced over the flap and reattached at the limbus. Choroidal drainage, where necessary, was performed at a separate inferotemporal site by a standard technique.
Main outcome measures: Visual acuity, IOP, presence of hypotonous maculopathy and the bleb appearance were compared pre and post operatively. Other prior interventions to control bleb function and interventions needed following bleb revision were also recorded. Age, sex and type of glaucoma were noted.
Results: Mean follow up was 517(106-764) days. Five patients were below 35 yrs old and two were children. Juvenile open angle glaucoma (3 eyes) and glaucoma associated with microspherophakia (3 eyes) were the commonest diagnoses. Hypotonous maculopathy with decrease in vision was the indication for surgery in all. Time between trabeculectomy and revision averaged 548(122-2363) days. Seven eyes had prior intrableb injection of autologous blood with failure to control overfiltration. Postoperatively, all patients showed reversal of hypotonous maculopathy with improvement of visual acuity to the pre morbid level. One patient developed a cataract but improved to 6/9 following cataract surgery. IOP averaged 2 ± 0.71 mmHg preoperatively and was 12 ± 4.95 mmHg at 6 weeks. At the last follow up the mean IOP was 12 ± 2.26 mmHg off all medication.
Conclusions: SPG was effective in reversing hypotony and hypotonous maculopathy. Patients undergoing SPG were significantly younger than those undergoing trabeculectomy during the same period (208 eyes, p < 0.01) suggesting young age as a risk factor for overfiltration. The duration of hypotonous maculopathy did not affect the rate or amount of visual recovery. Vision improved before clearance of choroidal effusions.
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P419 BLEB NEEDLING REVISION (BNR) WITH SUB-CONJUNCTIVAL 5- FLUOROURACIL (5FU) IN AFRICAN-CARIBBEAN PATIENTS IN BIRMINGHAM, UNITED KINGDOM

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Introduction: Regae (research in glaucoma and ethinicity) is a UK-based multidisciplinary research programme whose research is aimed at the prevention of avoidable glaucomatous blindness in the diverse ethnic population of the West Midlands, UK. Phase 3 of the project is involved in the outcome of surgical intervention with MMC-trab in this population. There is no information in the world literature regarding the use of BNR with 5fu in patients of African-Caribbean (AFC) origin.
Objectives: To investigate factors associated with postoperative BNR with 5fu in an AFC population following MMC-trabeculectomy and to identify factors associated with adverse outcome in this group.
Design: Interventional case series.
Participants: Prospective consecutive study of patients with advanced refractory glaucoma undergoing MMC-trabeculectomy under a single glaucoma-specialty team in Birmingham, UK.
Interventions: All patients underwent a mitomycin-c augmented trabeculecomy (modified cairns type trabeculectomy with fornix-based conjunctival flap with intraoperative MMC (0.1-0.4 mg/ml). Postoperative BNR with 5fu was performed in a subset of patients using the operating microscope in the operating theatre.
Main outcome measures: Intraocular pressure (IOP).
Results: A total of 229 eyes (190 patients) in total study group of which 43 eyes (19%) underwent BNR with 5fu. A subgoup of 35 patients (38 eyes) of African-Carribean ethnicity were identified. Mean age 52 years (range 11-77). Males/females 21:14. Glaucoma aetiology (no. eyes). Primary open angle glaucoma (POAG) (17); juvenile open angle glaucoma (JOAG)(11); traumatic (4); uveitic (1); fuchs (1); neovascular (1); pseudoexfoliation (1); pigmentary (1) normal-tension (1). Nine of the 38 AFC eyes (8 patients) (24%) underwent BNR with 5fu. Of this subset: Mean age 65 years; Male:female=4:4; Glaucoma aetiology: POAG (4); JOAG (2); traumatic (1), fuchs (1); PXF (1). Eight eyes (89%) were on at least 3 topical glaucoma medications preoperatively. Five eyes (56%) had previous additional ocular surgery. Mean no of BNR with 5fu = 1.7 (range 1-4). Six eyes (67%) underwent BNR with 5fu within 1 month of MMC-trab. Mean change in IOP following BNR with 5fu to be assessed. No complications following BNR with 5fu occurred.
Conclusions: Patients of AFC origin are a subset of patient at significant risk of requiring postoperative BNR with 5fu following MMC-trab. In this study addition to AFC ethinicty these patients have multiple risk factors associated with bleb failure. BNR can be safely and effectively performed in AFC eyes.
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P420 SAFETY AND EFFICACY OF RENEEDLING WITH 5-FLUOROURACIL IN FAILED TRABECULECTOMY BLEBS IN A DISTRICT GENERAL HOSPITAL

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Purpose: to determine the safety and efficacy of reneedling with 5-flurouracil in failed trabeculectomy blebs over a five-year period in a district general hospital.
Design: a retrospective casenotes review of 88 consecutive cases was undertaken and analysed performed by a single glaucoma surgeon (CMG).
Methods: several parameters were measured including age of patient, right or left eye, augmentation of initial bleb with antimetabolite, time to failure, mean preoperative intraocular pressure, visual acuity preoperatively, postoperative intraocular pressure, postoperative visual acuity, associated postoperative morbidity.
Main outcome measures: IOP <21mmHg and a reduction from baseline of 20%.
Results: IOP decreased from 27.6 ± 6.8mmHg (range 22-32 mmHg) to 15.4 ± 4.9 mmHg (range 8-22 mmHg) post reneedling with no appreciable visual morbidity immediately postoperatively. Subsequent visual decline was attributed to other factors such as cataract. 78% patients remained treatment free at 6 months.
Conclusion: Reneedling with 5-fluorouracil of failed trabeculectomy blebs is safe and effective in a district general hospital setting with low postoperative visual morbidity.
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P421 DEKOMPRESSION RETINOPATHY AND POSSIBLE RISK FACTORS

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Objective: To discuss the probable causes of decompression retinopathy.
Design: Case series.
Methods: We performed combined trabeculotomy-trabeculectomy with mitomycine c (MMC) under general anesthesia in a case of congenital glaucoma, trabeculectomy with MMC in a case of pseudofakic Fuchs' heterochromic iridocyclitis because of unresponsiveness to antiglaucoma medications and pars plana vitrectomy under general anesthesia in a case of vitreous condensation secondary to pars planitis. Decompression retinopathy appeared after these three surgeries, two after filtration surgery and one after pars plana vitrectomy.
Results: Retinal hemorrhages seen in cases with congenital glaucoma and pars planitis resorbed without any sequelae in 1-3 months. Retinal hemorrhages were also resorbed in case with Fuchs' heterochromic iridocyclitis, but the increase in visual acuity was not so high because of the involvement of the macula. In this case levels of plasma homocystein and CRP were detected as elevated.
Conclusion: We thought the long term preoperative intraocular pressure elevation, intraoperative use of MMC, young age, myopia, the preference of general anesthesia and factors causing vascular endothelial dysfunction (such as hyperhomocysteinemia and elevated CRP level) as the causes of decompression retinopathy.
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12.9. Surgical treatment: Trabeculectomy, goniotomy

P422 SURGICAL OUTCOME IN PAEDIATRIC GLAUCOMA

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Objective: To review the surgical outcome in various types of pediatric glaucoma cases.
Design: Retrospective interventional case series.
Participants: All children less than 14 years of age who were operated for glaucoma between March 2003 and April 2005 were included in this study.
Intervention: Patients with primary developmental glaucoma (PDG) underwent combined trabeculotomy with trabeculectomy (CTT) with MMC, whereas patients with secondary glaucoma underwent tube implant or transsceleral-cyclophotocoagulation (TSCPC) depending on their visual outcome. Follow up period ranged from 12 months to 30 months.
Main outcome measures: Pre- and postoperative intraocular pressure, corneal clarity, visual acuity, refractive error and complications.
Results: Forty-four eyes of 38 patients were included. Eighty percent (35 eyes) had primary developmental glaucoma and 20% (9 eyes) had secondary glaucoma. The success rate or probability of having a postoperative IOP <21 mmHg (without or with one antiglaucoma medication) and a clinically stable glaucoma at one year in primary cases was 88.57%. re-surgery was required in 11.43% cases. Success rate in secondary cases treated with tube implants/TSCPC was 66.67%. The mean percent reduction in IOP was 50.98% in primary cases and 24.33% in secondary cases. 9 eyes had minor intra- or postoperative complications but none had any sight threatening complications.
Conclusion: The prognosis in primary developmental glaucoma is good with CTT. Tube implant was found to be useful for the treatment of refractory pediatric glaucoma, and it may be safely used in a subgroup of eyes with uncontrolled IOP.
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P423 AN EASY APPROACH OF TRABECULOTOMY FOR CONGENITAL GLAUCOMA BY TRANSILLUMINATION AND DEEP SCLERECTOMY

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Purpose: To demonstrate an easy way for trabeculotomy by transillumination and deep sclerectomy methods and the surgical results in congenital glaucoma patients.
Design: Retrospective, noncomparative, surgical case series.
Participants: Eighteen eyes of 14 patients diagnosed with congenital glaucoma.
Intervention: Trabeculotomy combined with adjuvant transillumination and deep sclerectomy methods. The surgical procedures include 1) a limbus-based conjunctival flap, 2) first transillumination with ocutome illuminator to identify the surgical landmark, 3) a laminar limbus-based trapezoid scleral flap, 4) second transillumination to identify the Schlemm's canal and trabeculum area, 5) a second deep pentagonal scleral flap, dissecting from supra-ciliary body beneath the first flap, including deroofing of Schlemm's canal, 6) finding the Schlemm's canal and performing trabeculotomy, 7) suturing the second deep pentagonal scleral flap, 8) suturing the trapezoid scleral flap, and 9) a running suture of the conjunctival flap.
Main outcome measures: Preoperative and postoperative intraocular pressure.
Results: The follow-up time ranges from 1 to 7 years. The successful rate was 78% (14/18). In these successful eyes, the mean preoperative and postoperative intraocular pressure was 24.96±4.11 and 11.82±1.99 mmHg respectively. In the four failure eyes, one eye was operated at age of 16 years and 2 eyes of one case had received previous unsuccessful glaucoma surgery in another hospital.
Conclusions: Using adjuvant transillumination and deep sclerectomy methods, trabeculotomy can be performed more precisely and easily. The surgical outcome is satisfying.
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P424 TRABECULOTOMY IN CHILDHOOD GLAUCOMA: LONG-TERM RESULTS.

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Objective: To conduct research work on those factors that affect long-term evolution in patients suffering from childhood glaucoma.
Design: Non-comparative series of retrospective cases.
Participants: Forty-eight patients (80 eyes) with childhood glaucoma that have been observed during 24 years, at a 10-year-tracking average.
Method: Checking and review of medical records of those operated patients that have been diagnosed primary and secondary childhood glaucoma, at least at a 10-year-tracking.
Main Parameters Observed: Type of glaucoma, diagnosis age, first surgery age, pre-operative IOP, type of first surgery, good final visual acuity (better than 0.3), fair (between 0.3 and 0.1), poor (lower than 0.1); IOP during last visit.
Results: Forty-nine percent of operated eyes referred to patients suffering from primary childhood glaucoma. Ninety-five percent of these eyes were applied trabeculotomy as first surgery. Average pre-operation intra-ocular pressure in those eyes operated on primary childhood glaucoma reached 32 mmHg. Measurement read 17.53 mmHg during last control. Ninety percent of the eyes featured an intra-ocular pressure similar to or lower than 21 mmHg during last control. Seven percent of these eyes reached fair visual acuity, and a good one in patients with primary childhood glaucoma. Diagnosis average age in the cases of the eyes that had accomplished good visual acuity was 0.26 years, while in those cases featuring poor visual acuity such age was 1.61 years ($p<.001$). Average age for first surgery in eyes having good visual acuity was 0.35 years. On the other hand, average in those eyes featuring poor visual acuity was 2.31 years ($p<.0006$).
Conclusions: Trabeculotomy shows good results in achieving long-term control of intra-ocular pressure, especially in patients with primary childhood glaucoma. Intra-ocular pressure control is not the only factor that is related to a good visual outcome in patients suffering from childhood glaucoma. Good visual result in patients with primary childhood glaucoma is related to a three-month-average diagnosis, as well as to early surgery. Failing in being subjected to regular medical control turns out to be an important factor related to poor visual results in patients with primary childhood glaucoma.
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12.10. Surgical treatment: Cyclodestruction

P425 COMPRESSIVE TRANSSCLERAL PROBE FOR LASER CYCLOPHOTOCOAGULATION

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Introduction: The coagulation of the ciliary body depends on different parameters of irradiation, delivery systems and to a considerable degree on scattering properties of conjunctiva and sclera. Uncontrolled application of methods with monofibers do not take into account the dynamics of optical properties of sclera and conjunctiva with compression, which has an influence on spatial distribution of irradiation. Such application can result in unpredictable outcomes of cyclophotocoagulation and complications. The clinical results of different probes including the known g-probe demonstrate such failures.
Purpose: To increase the safety of cyclophotocoagulation, reduce the risk of sclera perforation, enhance the sclera transmission progressively with compressive transscleral probe and standardize the effects with different sclera conditions using controlled compression of the fiber tip.
Methods: We have developed a set of compact probes for contact-compressive effect. The probe represents a cylindrical construction of different dimensions with 600 μm movable monofiber. The fiber is fixed in the springing attachment, which provides a dosed controlled compression of the monofiber tip into sclera. Taking into account experimental and theoretical data about a significant increase of direct transmission of sclera and conjunctiva with compression the probe provided a dosed impression of the fiber end into sclera with compressive force of 1-5×104 dynes. The developed probe was equipped with a 0.81 μ diode laser with power of 0.1-3 w. The compressive probe with diode laser was used on more than 70 patients with different types of glaucoma. We used cw-power of 1-2 w, duration of 1 sec, and applications number of 30-40 at 270º at 1.5 mm from the limbus. Taking into consideration inertia of squeezing effects, the cyclophotocoagulation was applied in 5-10 seconds after initial compression of the fiber into sclera.
Results: The application of compressive probe for laser cyclophotocoagulation almost eliminated the risk of severe complications. Slight efforts of compression (up to 104 dynes) permitted to avoid the damage of sclera in the case of its thinning in some pathological states. The efforts of up to 4×104 dynes were used for elderly patients with age-related changes in sclera. The treatment was assessed on standard criteria. The success rate was 86% after 1-3 sessions, the mild complications rate was 8%. No severe complications were observed such as hypotonia or phthisis, which are relevant to many methods, including standard protocol cyclophotocoagulation. In some cases, there was a local hemorrhage, damage of conjunctiva and sclera, mild postoperative inflammation and pain.
Conclusion: Compressive probe is a simple and convenient device. The design of the probe provides sterilization and the replacement of operating monofiber if necessary. The method of laser irradiation delivery with developed probe increased the efficacy of cyclophotocoagulation. The application of the probe allowed us to modify cyclophotocoagulation, which provided the success rate comparable with methods of relatively small power of laser irradiation with low risk of complications.

P426 ENDOSCOPIC CYCLOPHOTOCOAGULATION WITH PHACOEMULSIFICATION: AN EVIDENCE-BASED, RANDOMIZED, PROSPECTIVE, CONTROLLED LONG TERM STUDY

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Purpose: To establish whether adding endoscopic cyclophotocoagulation (ECP) to phacoemulsification (PHACO) in the management of medically controlled glaucoma and cataract diminishes long-term glaucoma medication requirements and/or intraocular pressure compared to phacoemulsification alone.
Design: Prospective, randomized, controlled, long-term study.
Participants: Seven hundred seven eyes treated by five surgeons. Statistician assigned 626 PHACO-ECP and 81 PHACO alone.
Results: PHACO-ECP mean pre-operative IOP 19.08 ± 4.14 mmHg and 15.73 ± 3.00 post-operatively (p= 4.48 x 10-72). In PHACO alone arm pre-operative IOP 18.16 mmHg ± 3.38 mmHg, and 18.93 ± 4.12mmHg post-operatively (p=.01). Mean number of glaucoma medications 1.53 +/- 0.89 in PHACO-ECP arm, decreasing to 0.65 ± 0.95 (p=1.23 x 10-85) post-operatively. Pre-treatment PHACO alone group 1.20 ± 0.83 and 1.20 ± 0.87 post-operatively (p=.50) (image 1). There was no difference in the incidence of cme, retinal detachment, or other complications between the groups. PHACO-ECP patients spent $1,503.57 per year less on glaucoma medications; control patients $189.96 more per year. Mean follow-up 3.2 years (0.5 5.8).
Conclusion: This is the largest long-term surgical glaucoma study reported. The control group embodies the largest cohort of medically controlled glaucoma patients and their eventual course following phacoemulsification. Adding ECP to PHACO diminishes IOP and patients' long-term medications without increased risk. Significant financial benefit accrued to these patients. PHACO alone neither decreases IOP or medications. These powerful results suggest a paradigm shift in management of the cataract surgery patient with concomitant medically controlled glaucoma. Combining ECP with PHACO should be considered the treatment of choice in this common situation.
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P427 REPRODUCIBILITY OF TREATMENT GUIDELINE FOR DIODE LASER TRANSSCLERAL CYCLOPHOTOCOAGULATION (TSCPC) FOR INTRACTABLE GLAUCOMA

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Objective: Cyclophotocoagulation (based on level III evidence) is indicated for patients with refractory glaucoma. Various authors have described schemes for how the procedure should be delivered and have varied between standardised 'doses' with up to several treatments and more aggressive initial applications aimed at reducing the number of treatment sessions. A refinement of technique may allow a more predictable result hence we formulated a treatment guideline with variable dosing following review of literature.
Design: Prospective audit. In the first loop, single surgeon carried out all the treatment to reduce interindividual variability. An audit was done to compare our practice with the published literature. We reaudited our care after three years to evaluate the reproducibility of the treatment guideline when more than one surgeon performed the procedure.
Participants: Patients were divided into two groups. Group I: trabeculectomy contraindicated (seeing eyes). Group II: painful blind eyes (non-seeing eyes). Group I included patients who had previous multiple procedures either surgical drainage including valve, or laser trabeculoplasty, or deemed to present too high a risk of failure because of conditions like cicatricial conjunctivitis or declined surgery. Group II included patients who had high IOP with no potential of recoverable vision.
Methods: Transscleral cyclophotocoagulation was carried out using the oculight SLX semiconductor diode 810 nm laser system with contact g-probe delivery (iris medical instruments, mountain view, ca 94043 www.irismedical.com). (table 1)
Main outcome measures: Treatment was considered a success when there was both (i) an intraocular pressure (IOP) reduction of 30% from the preoperative baseline value and (ii) final IOP ≤ 22 mmHg with or without topical/oral medications. In group II success criteria were defined as either significant reduction of discomfort of the eye or pain-free or in the patients with decompensating cornea, clear cornea with an intact epithelium.
Results: Our results from both loops of the audits show that the treatment guideline is fairly reproducible and the results comparable with other series in the literature with one of the lowest retreatment rate (25.7%). (table 2)
Conclusion: Diode laser tscpc is a relatively safe procedure for refractory glaucoma over medium term. The low retreatment rate vis a vis success rate and reproducibility of the treatment guideline is a valuable feature.
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P428 INITIAL EXPERIENCE WITH MICROPULSE DIODE LASER TRANSSCLERAL CYCLOPHOTOCOAGULATION FOR SEVERE GLAUCOMA

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Aim: To evaluate the efficacy and safety of micropulse diode laser transscleral cyclophotocoagulation for the treatment of severe glaucoma.
Design: Prospective interventional case series.
Patients and Methods: This is a single centre, prospective study of 23 eyes of 21 patients with medically uncontrolled glaucoma who were treated with micropulse diode laser transscleral cyclophotocoagulation using a customized fiberoptic probe. The procedure was performed by a single surgeon from between May 2006 to Jan 2007, and patients were followed up for 6 months. If the intraocular pressures remained above 21mmHg despite medications for more than 1 month after cyclophotocoagulation, the procedure was repeated.
Results: The mean follow up was 5.4 + 1.3 months. Rate of relative success, defined as a 30% or more reduction in intraocular pressure and/or a final intraocular pressure below 21 mmHg, was 68.8% at 6 months. Mean intraocular pressure was reduced from 35.7 + 8.96 mmHg to 14.9 + 8.05 mmHg at 1 month ($p < 0.001$), 14.1 + 10.1 mmHg at 3 months ($p < 0.001$) and 14.4 + 7.42 mmHg at 6 months ($p < 0.001$). All patients were taken off oral acetazolamide. The number of pressure lowering eye drops was reduced from 1.9 + 1.1 to 1.5 + 1.3 at 6 months ($p = 0.01$).No major complications were encountered.
Conclusion: Micropulse diode laser transscleral cyclophotocoagulation appears to be an effective and safe method of reducing intraocular pressures in cases of medically uncontrolled glaucoma, with the pressure-lowering effect persisting for at least 6 months.
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12.11. Surgical treatment: Cyclodialysis

P429 AB-EXTERNO CYCLODIALYSIS WITH TRABECULECTOMY : A NEW WAY OF TREATING INTRACTABLE GLAUCOMA AFTER PENETRATING KERATOPLASTY

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Purpose: To report the effect of cyclodialysis ab externo combined with trabeculectomy augmented by mitomycin c in post- keratoplasty glaucoma.
Design: Prospective non-comparative interventional case series.
Methods: Ten eyes of 10 patients with refractory glaucoma after penetrating glaucoma underwent cyclodialysis along with augmented trabeculectomy. The following variables were evaluated; visual acuity, intraocular pressure (IOP) and corneal clarity over a follow up of 11.14+1.4 months. [95%ci 9.7-12.5]
Results: The procedure resulted in a 28.4% reduction of IOP postoperatively at each time point of follow up in each case. No untoward complications like vitreous haemorrhage or choroidal detachment were seen in any case. The corneal graft clarity was unchanged in clear grafts and there was a mildly increased clarity of the cornea in failed grafts. The visual acuity showed a mild improvement or remained the same in all cases.
Conclusions: Cyclodialysis ab-externo with augmented trabeculectomy provides a simple, safe and effective method of lowering IOP in intractable glaucoma following penetrating keratoplasty without compromising the corneal graft.
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12.12.2. Surgical treatment: Cataract extraction: Extracapsular

P430 IOP DROP AFTER CATARACT CHOP

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Objective: To quantify changes in intraocular pressure (IOP) following uneventful small incision cataract extraction (SICS) with posterior chamber intraocular lens (PC IOL) implantation and to find out the impact on the medical/surgical management of glaucoma patients.
Design: Non-randomized clinical trial.
Participants: Thirty-five medically controlled patients attending the glaucoma clinic.
Methods: The authors retrospectively reviewed preoperative and postoperative IOP in 35 randomly selected medically-controlled glaucoma patients who underwent uneventful SICS/PC IOL. None of the patients had prior intraocular surgery.
Main outcome measures: Intra-ocular pressure in mmHg.
Results: The mean preoperative IOP in the POAG group was 18.1±3.1 mmHg. With a mean follow-up of 16.4 months, the average postoperative IOP in the POAG group was 15.2±2.9 mmHg (P value < 0.001 %). The mean preoperative IOP in the PACG group was 19.3±2.2 mmHg. With a mean follow-up of 14.8 months, the average postoperative IOP in the PACG group was 10.2±2.3 mmHg (P value < 0.001 %). The overall average decrease in anti-glaucoma medication was from 2.1 to 1.8.
Conclusion: SICS/PC IOL may be associated with a significant decrease in IOP in glaucoma patients, allowing for decreased postoperative anti-glaucoma medication and delaying or preventing filtration surgery. As expected, the IOP fall was greater in PACG patients. Among the POAG group, the fall in IOP was greater in patients with pseudo-exfoliation glaucoma.
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P431 HYPOTONIC EFFECT OF PHACO CATARACT SURGERY ON NORMAL AND GLAUCOMATOUS EYES

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Aim: To objective the hypotonic effect of cataract surgery and influence of 2 particular IOLs (Concept 360 SE and IDEA) on anterior segment of the eye.
Methods: One hundred twenty-eight patients and 131 cataracts in the prospective study were divided into 6 different groups of cataracts and IOL implantation. AC depth and volume, AC angle and IOP were measured immediatelly before and minimally 1 month after cataract surgery using PENTACAM (rotating Scheimpflug camera). Wilcoxon test was used for statistic valuation.
Results: The above-mentioned data were measured (average±SD before/average±SD after): 1. In the groups of

24 normal cataracts with acrylate IOL implantation: 2.7±SD /4.9±SD mm, 151±SD /219±SD mm^3, 34o±SD/45o±SD and 13.6±SD/13.0±SD mmHg. 2. In the groups of 14 normal cataracts with PMMA IOL implantation: 2.7±SD/5.0±SD mm, 155±SD /186±SD mm^3, 30.6o±SD /44o±SD and 15,8±SD /12,0±SD mmHg. 3. In the groups of 31 cataracts with verified open angle glaucoma and acrylate IOL implantation: 2.3±SD /4.2±SD mm, 124±SD /172±SD mm^3, 28.1o±SD /40.2o±SD and16.3±SD /14.5±SD mmHg. 4. In the groups of 6 cataracts with closed angle implantation: 1.9±SD /4.6±SD mm, 89.5±SD /156.3±SD mm^3, 30.4o±SD /37.5o±SD and 32.4±SD /11.8±SD mmHg. 5. In the groups of 38 normal cataracts with Concept 360 SE IOL implantation: 2.8±SD /5.4±SD mm, 157±SD /208±SD mm^3, 33.6o±SD /45,2o±SD and 16.2o±SD /12.6o±SD mmHg. 6. In the groups of 20 normal cataracts with Idea IOL implantation: 2.7±SD /4,6±SD mm, 162±SD /203±SD mm^3, 34,3o±SD /42,3o±SD and 14.7±SD /13.3±SD mmHg.

Conclusions: We have documented the significant influence of cataract surgery on IOP, AC depth, AC volume and AC angle in all mentioned groups. The most significant effect was measured in the group of cataract with chronic closed angle glaucoma. In this group was not so high encrease of AC volume and depth compared with the other groups. There was no significant difference in mentioned datas between the groups of particular IOLs and the other IOLs.

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12.12.3. Surgical Treatment: Cataract extraction: Phacoemulsification

P432 PHACOEMULSIFICATION AND SUBLAXATED CATARACTS WITH SMALL PUPIL

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Purpose: Surgical management of subluxated cataracts and the presence of a small pupil present a challenge to anterior segment surgeons. The aim of the present study was to evaluate the outcome of phacoemulsification and combined phacotrabeculectomy in eyes with sublaxated cataracts mainly due to pseudoexfoliation (PSX) and poorly dilating pupils.

Design: Retrospective, non randomized study.

Participants: This study comprised 33 eyes of 32 patients with poor zonular support and mid-dilating to narrow pupils, with the etiology of pseudoexfoliation, operated between january 2005 and august 2006.

Methods: Cataract surgery was performed on 17 eyes and combined phacotrabeculectomy on 16. In 11 eyes an intracapsular tension ring (ICTR) was implanted, in 12 eyes iris hooks were used to capture the anterior capsulorhexis fixating the lens and dilating the pupil. In10 eyes iris hook were used in combination with ICTR(4). Mean follow-up was 4 months (range 1 week-18 months). This study was approved by the institutional review board (IRB).

Main outcome measures: Visual acuity (VA), mean intraocular pressure (IOP) before and after surgery, postoperative IOL position and complications.

Results: Mean VA preoperatively as assessed by Snellen charts was 6/56 and 6/22 postoperatively ($p<0.01$), an average gain of 3 lines. Mean IOP in the cataract alone group was similar pre and postoperatively (11.6 and 11.7 mmHg respectively). The IOP in the combined phacotrabeculectomy group was 16.3 preoperatively and 9.76 mmHg postoperatively ($p<0.01$). All IOLs remained clinically and geometrically well centered during the follow-up period. Five eyes (14%) required IOL fixation during surgery (4 iris fixation and 1 scleral). As for complications, 4 eyes (12%) required an anterior vitrectomy. Fibrin reaction in the anterior chamber was found in 3 eyes (9%) postoperatively.

Conclusions: Phacoemulsification using iris hooks and/or ICTR offers a safe and efficacious surgical technique in eyes with poor zonular support and mid to narrow pupils. This study shows significant improvement in visual acuity, significant decrease in IOP in the phacotrabeculectomy group and a low rate of complications.

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P433 EFFECT OF CATARACT SURGERY ON ANTERIOR CHAMBER ANGLE PARAMETERS IN EYES WITH CHRONIC PRIMARY ANGLE CLOSURE GLAUCOMA

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Objective: To evaluate the angle parameters after cataract extraction in eyes with chronic primary angle-closure glaucoma (PACG) and co-existing cataract.

Design: Cross-sectional prospective study.

Participants: Seventeen consecutive chronic primary an-

gle-closure glaucoma patients with co-existing cataract were recruited in this prospective study.
Intervention: After obtaining informed consent, cataract extraction by phacoemulsification through a temporal clear corneal incision was performed followed by intraocular lens implantation. Preoperative and post operative angle parameters were assessed on ultrasound biomicroscopy (UBM).
Main outcome measures: Outcome measures included intraocular pressure (IOP) and UBM parameters. The various UBM parameters evaluated were superior and inferior trabecular iris angle (TIA), angle opening distances at 250 and 500 microns (AOD 250 and AOD 500) and central anterior chamber depth (ACD).
Results: Mean age (±sd) was 60.5 ± 11.5 years. Baseline intraocular pressure (IOP) was 52.25 ± 17.01 and IOP after maximum medical therapy was 21.5 ± 4.8 mmHg. The IOP decreased to 14.3 ± 5.1 mmHg at 6 weeks of follow-up visit (p = 0.0001) without any antiglaucoma medication. The superior and inferior angle angle was closed in 11 (64.7%) of cases which opened up post-cataract surgery. Preoperative superior TIA was 3.85 ± 6.54 and inferior TIA was 4.13 ± 7.6 degrees. Postoperative superior and inferior TIA increased to 18.1 ± 12.9 and 21.6 ±14.9 respectively (p value 0.002 and 0.001). Preoperative superior AOD 250 and 500 was 0.026 ± 0.042 and 0.071 ± 0.0.028 which increased to 0.131 ± 0.074 and 0.241 ± 0.131 respectively (p< 0.001 and 0.002). Inferior AOD 250 and 500 was 0.035 ± 0.048 and 0.1088 ± 0.187 preoperatively which later increased to 0.235 ± 0.297 and 0.371 ± 0.309 respectively (p value < 0.03 and 0.01 respectively). Central ACD was 1.86 ± 0.42 mm before surgery and increased to 2.96 ± 0.36 mm after surgery (p value < 0.001).
Conclusions: n primary angle-closure glaucoma patients cataract extraction alone can significantly reduce intraocular pressure and can widen the angle and increase anterior chamber depth.
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P434 THE EFFECT OF INITIAL PHACOEMULSIFICATION IN THE MANAGEMENT OF CATARACT AND PAC WITH PAS MORE THAN 180 DEGREE

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Objective: To evaluate the effect of phacoemulsificaiton in the management of cataract and acute primary angle closure (APAC) or primary angle closure glaucoma (PACG) with peripheral anterior synechias (PAS) more than 180 degrees.
Design: Prospective, observational case series.
Participants: Twenty-five eyes of 25 patients with cataract and APAC or PACG were enrolled in this study.
Methods: All eyes underwent phacoemulsification and posterior chamber intraocular lens implantation.
Main outcome measures: Best corrected visual acuity (VA), anterior chamber depth (ACD), intraocular pressure (IOP) and complications were evaluated. The extent of pas was observed using gonioscopy and UBM.
Results: Mean postoperative follow-up was 3.76 months. IOP was controlled postopertively in 24 eyes (96%) without ocular hypotensive medications and in 1 eye (4%) with 1 kind of medication. The mean preoperative IOP was 28.6 mmHg±21.0 (SD). The mean postoperative IOP was 13.4±12.5 mmHg at the end of the study period. VA was improved or remained unchanged in 24 eyes (96%). Although acd in all eyes was deepened from 1.6±0.4 mm preoperatively to 3.4±0.3 mm postoperatively, the extent of pas was less in 15 eyes (60%) on gonioscopy and UBM postoperatively. The chamber angle opened completely in 8 eyes (32%). The main complications included exudationin in 5 eyes (20%) light corneal edema in 5 eyes (20%) iris destruction in 1 eye (4%) viscoelastic substance stayed in anterior chamber in 2 eyes (8%) and hemorrhage of retina in 1 eye (4%).
Conclusions: IOP could be controlled through phacoemulsificaiton in patients with cataract and APAC or PACG with pas more than 180 degree in short-term follow-up. However, IOP still should be monitored periodically especially for the cases with pas more than 180 degree postoperatively.
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P435 CHANGES IN INTRAOCULAR PRESSURE AFTER CLEAR CORNEA PHACOEMULSIFICATION IN JAPANESE OPEN ANGLE GLAUCOMA PATIENTS

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Purpose: To evaluate the changes in intraocular pressure (IOP) and glaucoma medication requirements after clear cornea phacoemulsification in eyes with medically controlled open angle glaucoma.
Design: Retrospective chart review.
Participants: This study represents an analysis of well-controlled glaucoma patients with co-existing cataract who had cataract extraction only.
Methods: In all patients, cataract surgery was performed by clear cornea phacoemulsification with acrylic foldable lens (IOL) implantation. The patients were classified into 2 groups: primary open angle glaucoma (POAG), and normal tension glaucoma (NTG). Patients with a history of previous intraocular surgery were excluded. ***Main outcome measures:*** Outcome measures were postoperative IOP and number of glaucoma medications.
Results: Twenty-one eyes in POAG group and 24 eyes in NTG group were recruited. Preoperatively, the mean IOP of POAG group was 16.7±3.0mmHg and that of NTG group was 14.0±2.2mmHg. At the postoperative final follow-up visit, the IOP was significantly decreased in both groups; POAG group decreased 2.0±3.4 mmHg (p=0.013) and NTG group 2.0±3.9 mmHg (p=0.025). The number of glaucoma medications required was significantly decreased in both groups; POAG group decreased from a mean preoperative level of 2.1±0.9 to 1.0±1.1 (p=0.0001) and NTG group 1.3±1.0 to 0.6±0.8 (p=0.001). There were no differences in changes in IOP or number of glaucoma medications between POAG group and NTG group. ***Conclusion:*** In well-controlled POAG and NTG patients with co-existing cataract, cataract extraction alone by clear cornea phacoemulsification with foldable acrylic iol implantation can significantly reduce both IOP and the requirement for glaucoma medications.
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P436 INTRAOCULAR PRESSURE MEASURMENT DURING PHACOEMULSIFICATION
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Purpose: To assess changes in intraocular pressure (IOP) during standard coaxial phacoemulsification with different incisions and closure techniques.
Setting: Department of Ophthalmology in Menofia University and Beni Sweif University.
Methods: Standard coaxial phacoemulsification phacoemulsification was performed in 72 patient eyes. Intraocular pressure was measured using the shoitz tonometer after autoclave sterilization. The phacoemulsification procedure was broken down into 8 stages, and mean IOP was calculated across each stage.
Results: Intraocular pressure exceeded 60 mmHg (retinal perfusion pressure) during standard coaxial phacoemulsification in some eyes with small tight incisions. The highest IOP occurred during hydrodissection and ophthalmic viscosurgical device injection.
Conclusion: The shoitz tonometer measeurment is not the ideal method for measurning the IOP during phacoemulsification but it gives an ideal about the iOP changes without the need for invasive technique in measuremnt of the IOP.

12.14.3. Surgical treatment: Combined cataract extraction and glaucoma surgery: Phacoemulsification

P437 LONG TERM INTRAOCULAR PRESSURE (IOP) CONTROL IN PATIENTS UNDERGOING SINGLE SITE PHACOTRABECULECTOMY WITH FOLDABLE ACRYLIC INTRAOCULAR LENS IMPLANTATION
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Methods: We analyzed our results in 24 consecutive patients who had undergone phacotrabeculectomy with foldable IOL implantation for coexisting cataract and glaucoma. All patients had undergone combined trabeculectomy with phacoemulsification through superior single incision.
Results: The IOP lowered from 22.4± 5.2 mmHg (with maximum medical therapy) to 14.2± 2.3 mmHg after a mean followup of 30± 16.5 months (range 6-60 months). Only one patient required single antiglaucoma topical drug to control IOP. The best corrected visual acuity of 6/12 or better was achieved in 85.9% of the patients.
Conclusion: Single site phacotrabeculectomy is a safe and effective surgery for IOP control and visual rehabilitation in patients having co-existing cataract and glaucoma.
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P438 PHACOEMULSIFICATION IN EYES WITH CATARACT AND FUNCTIONING FILTERING BLEBS: A STUDY OF INTRAOCULAR PRESSURE AND ULTRASOUND BIOMICROSCOPIC IMAGE OF FILTERING BLEBS

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Objective: To evaluate the effects of phacoemulsification on IOP and UBM images of filtering bleb and the effects of preoperative IOP and UBM images of filtering bleb on the success rate of antiglaucoma after phacoemulsification in eyes with cataract and a previous functioning filtering bleb.
Design: Self-controlled trial.
Participants: Twenty-four patients (27 eyes) who underwent phacoemulsification after successful trabeculectomy, with 12 months of follow-up.
Intervention: Clear corneal phacoemulsification and implantation of a foldable intraocular lens in eyes that underwent a previous successful trabeculectomy. The time between both procedures was from 11 to 29 months.
Main outcome measures: Preoperative and postoperative IOP were recorded at each follow-up examination. The filtering blebs were examined using UBM at the 12 months after phacoemulsification. Success was defined as the absence of glaucoma medications, bleb needling, or further glaucoma surgery to maintain IOP control after phacoemulsification. Preoperative IOP and two parameters of the UBM images, including visibility of a route under the scleral flap and reflectivity inside the bleb, were evaluated for an association with postoperative success rate using Kaplan-Meier survival analysis.
Results: The mean IOP before phacoemulsification was 12.46 ± 4.75 mmHg, and it increased 5.50, 3.85, 3.11, 3.05, 2.79 and 2.58 mmHg on the first postoperative day, after 1 week, 1month, 3 months, 6 months and 12 months, respectively. At each interval, the mean IOP was significantly higher than the preoperative value (p = 0.000, 0.000, 0.000, 0.000, 0.000 and 0.000, respectively). There was no statistically significant difference in visibility of the route under the scleral flap and reflectivity inside the bleb between before and after phacoemulsification (p = 0.398 , 0.096). An IOP greater than 10 mmHg and a filtering bleb with an invisible route under scleral flap and stronger reflectivity inside bleb before phacoemulsification were associated with postoperative antiglaucomatous failure (p = 0.025, 0.000, and 0.000, respectively).
Conclusions: Phacoemulsification significantly increased IOP, but had no obvious effects on the features of filtering bleb in UBM image. Eyes with higher IOP, invisible route under scleral flap and stronger reflectivity inside bleb in UBM image before phacoemulsification had greater postoperative antiglaucomatous failure.
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P439 MICROINVASIVE NONPENETRATING DEEP SCLERECTOMY COMBINED WITH PHACOEMULSIFICATION (TECHNIQUE AND RESULTS)

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POSTER WITHDRAWN

P440 USE OF TRYPAN BLUE TO ASSESS FILTRATION FUNCTION IN EYES WITH A FILTERING BLEB UNDERGOING PHACOEMULSIFICATION

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Objective: To report the use of trypan blue staining of filtering bleb to assess filtration function in eyes with operated trabeculectomy undergoing phacoemulsification cataract surgery.
Design: Cross-sectional interventional study.
Participants: Twenty two eyes of consecutive patients with operated trabeculectomy with co-existing cataract were recruited in this prospective study.
Intervention: Trypan blue (0.6 mg/ml) was used to stain the anterior capsule to aid visualization of the anterior capsule prior to capsulorhhexis. Cataract extraction by phacoemulsification through a temporal clear corneal incision was performed followed by intraocular lenses implantation in capsular bag.
Main outcome measures: Bleb staining was observed and divided into four patterns of diffuse, patchy, minimal and no staining.
Results: Diffuse staining of the filtering bleb was seen in 10 eyes, patchy staining was seen in 4 eyes, minimal staining in 2 eyes and no staining in 6 eyes. Diffuse staining occured in eyes which had undergone trabeculectomy with mitomycin c and had intraocular pressure (IOP) ranging from 6-12 mmHg preopoeratively. Eyes with patchy and minimal staining had IOPs ranging from 14-18 mmHg, while no staining was seen in two cases with IOPs ranging from 18-24 mmHg (on timolol).
Conclusions: Trypan blue staining during cataract surgery in eyes with filtering blebs can be used to study the patency of the trabeculectomy fistula, assess the amount of filtration and as an aid in planning intra-operative bleb resuscitation in eyes with a failing filtering bleb.

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P441 COMPARISON BETWEEN SINGLE SITE VERSUS TWO SITES PHACOTRABECULTOMY WITH NON FOLDABLE PMMA LENS

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Objective: The objective of the study was to compare the result of temporal 5.5 mm clear corneal phacoemulsification supplemented by two interrupted corneal suture with superior trabeculectomy versus one site tunnel phacoemulsification with trabeculectomy. Non-foldable lenses were used in both techniques.
Design: Retrospective analysis of two case series.
Participants: Forty-two eyes of 24 patients (14 male and 10 female) of cataract and POAG with IOP range 24 32 included in this study.
Method: Twenty-two eyes of selected 22 patients were allotted in group i who had undergone phacoemulsification followed by non foldable PMMA implantation with separate superior trabeculectomy. The 5.5 mm clear corneal wound was adequately apposed with two interrupted sutures. The 18 other eyes of 18 of the 22 patients in group i and 2 eyes from the remaining two patients were included in group ii who had undergone single site scleral tunnel phacotrabeculectomy with non foldable PMMA IOL implantation. Mitomycin c was applied for 2 minutes over sclerotony site in all cases. All the antiglaucoma medicine was stopped three weeks before surgery.
Main outcome measures: The main parameters being measured include intraocular pressure, visual acuity and number of antiglaucoma medicine used before and after the surgery.
Results: Mean follow-up time for group i and ii was 14.6 and 16.4 months. The mean IOP was reduced significantly in both groups upto12 months of follow up. After 12 months, IOP was lower more in group i than in group ii which was not statistically significant. In 20 eyes (90.9%) of group i and 17 eyes (85%) of group ii visual acuity was significantly improved from pre operative level beyond 3 months follow up. 21 eyes(95.45%) of group i and 18 eyes(90%) of group ii no longer needed any antiglaucoma medicines till the final follow up. Ocular hypotony was noted in 3 patients (13.64%) in group i and 1 patient (5%) in group ii.
Conclusion: The single site and two sites phacotrabeculectomy with non foldable PMMA IOL implantation appear to be comparable with respect to the post operative IOP control and visual acuity. Though post operative astigmatism and ocular hypotony was slightly more in two sites phacotrabeculectomy, these can be significantly reduced by applying two interrupted sutures at cornea incision.

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P442 TWO-STAGE VERSUS ONE-STAGE PHACOTRABECULECTOMY: INTRAOCULAR PRESSURE- LOWERING EFFECT

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Purpose: Combined trabeculectomy and phacoemusification (phacotrabeculectomy) has been reported to provided less intraocular pressure reduction and smaller success rates compared with trabeculectomy alone. We demonstrated that hypotensive effect of trabeculectomy after corneal incision phacoemusification was better than that of combined procedure. Intraocular pressure-lowering effect of separate procedure (two-stage phacotrabeculectomy) and simultaneous combined procedure (one-stage phacotrabeculectomy) was compared.
Design: Randomized study.
Participants: Thirty patients (30 eyes) with glaucoma and cataract were studied. Fifteen patients underwent two-stage phacotrabeculectomy and 15 patients underwent one-stage phacotrabeculectomy.
Interventions: In the two-stage group, trabeculectomy was carried out after phacoemulsification with mean interval of 3.1 ± 0.7 months (2 to 4 months). In the one-stage group, combined phacoemusification and trabeculectomy were performed simultaneously.
Main outcome measures: Success rate based on intraocular pressure and incidences of complications were studied.
Results: Mean intraocular pressure at baseline and at 12 months postoperatively were 25.3±2.6 mmHg and 13.1±3.3mmHg in the two-stage group, 24.7±2.7 mmHg and 15.3±4.4mmHg in the one stage group. Mean intraocular pressure change in the two-stage group (-48.2±15.5%) was greater compared with that in the one-stage group (-38.1±16.8%); this is not significant (P = 0.09). The number of eyes with 20 mmHg or less at 12 months was 14 eyes (93%) in the two-stage group and 12 eyes (93%) int the one-stage group. Complications included two cases

(13%) in the two-stage group and four cases (27%) in the one-stage group of choroidal detachment.
Conclusions: There is a possibility that hypotensive effect of two stage phacotrabeculectomy may be greater compared with one stage phacotrabeculectomy.

P443 COMPARISION OF PHACOTRABECULECTOMY AND TRABECULECTOMY IN THE TREATMENT OF APAC OR PACG WITH CONCURRENT CATARACT

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Objective: To compare the effects of phacotrabeculectomy and trabeculectomy in the treatment of acute primary angle closure (APAC) or primary angle closure glaucoma (PACG) with concurrent cataract.
Design: Prospective, non-randomized clinical trail.
Participants: The study patients consisted of APAC or PACG with concurrent cataract. Group 1 composed 35 phacotrabeculectomy in 32 patients. Trabeculectomy was performed in group 2 with 29 eyes of 25 patients .
Methods: The patients were undergone phacotrabeculectomy in group 1 and trabeculectomy in group 2, respectively.
Main outcome measures:The effect of glaucoma control was evaluated using best corrected visual acuity (VA), intraocular pressure (IOP), gonioscopy appearance, and UBM.
Results: IOP control was achieved in 32 eyes (91%) in group 1 and in 23 eyes (79%) in group 2. Mean preoperative IOP was 41.7 mmHg± 15.1 (sd) and 35.8±15.6 mmHg, respectively. Mean postoperative IOP was 12.4±5.4 mmHg (group 1) and 13.4±7.7 mmHg (group 2) after a mean follow-up of 10.2 and 10.0 months, respectively. Mean number of ocular hypotensive medications preoperatively was 3.0 ± 1.5 in group 1 and 2.7±0.9 in group 2 and at last follow-up, 0.1 ± 0.5 and 0.2±0.5 repectively. 31 eyes (89%) in group 1 had the same or better final visual acuity than before surgery. In group 2, the final visual acuity was unchanged or better in 14 eyes (48%) and worse in 15 eyes (52%). The main complications in group 1 included early postoperative IOP elevation in 2 eyes (5.7%) and inflammatory reaction in 10 eyes (28.6%). The main complications in group 2 included shallow anterior chamber in 8 eyes (28%), malignant glaucoma in 2 eyes (7%).
Conclusions: Phacotrabeculectomy may be more benefit to enhance VA and control IOP in patients with APAC or PACG and cataract than trabeculectomy.
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P444 COMBINED DEEP SCLERECTOMY WITH EX-PRESS X-200 IMPLANT AND CATARACT EXTRACTION IN REFRACTORY GLAUCOMAS

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Purpose: To evaluate the efficacy and safety of combined phacoemulsification and glaucoma surgery using the ex-press x-200 drainage device for the surgical treatment of coexistent cataract and glaucoma.
Design: Prospective, monocentric, non- randomized clinical trial.
Participants: Twenty-five patients.
Methods: This study was performed on 25 eyes suffering from coexistent cataract and medically uncontrolled glaucoma. Phacoemulsification was followed by deep sclerectomy with x-200 drainage device implantation. Biomicroscopy, best corrected visual acuity (BCVA) and applanation intraocular pressure (IOP) measurements, fundus examination, were performed before surgery, at 1 day, 1 week, and 1, 2, 3, 6 and 12 months after surgery.
Main outcome measures: OP, BCVA, medication per patient.
Results: The mean age was 79.6 ± 1.6 years (mean ± sem) and the mean post operative follow-up was 12.2 ± 0.71 months. The preoperative IOP was 19.5 ± 1.2 mmHg and the BCVA 0.39 ± 0.04. At 12 months IOP was 10.9 ± 0.9 mmHg. The BCVA went to 0.69 ± 0.06. The mean number of medication per patient changed from 2.4 ± 0.2 to 0.1 ± 0.1 12 months after surgery. Nd:YAG capsulotomy was performed on one eye. Needling with mitomycin c was required for 4 patients (16%). Complete success was 68.0%, qualified success 85.1%, the failure rate for cases requiring further surgery was 8%.
Conclusions: The results at 12 months indicate that combining a phacoemulsification and a modified deep sclerectomy using the ex-press x-200 implant remains effective in controlling the intraocular pressure with few surgery related complications.
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P445 COMPARATIVE ANALYSIS OF PHACOTRABECULECTOMY IN PSEUDOEXFOLIATION GLAUCOMA VERSES NONPSEUDOEXFOLIATION GLAUCOMA

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Objective: To compare and asses the surgical complications of phacotrabeculectomy in pseudoexfoliation verses nonpeudoexfoliation glaucoma.
Design: Patients with pseudoexfoliation glaucoma and patients with primary open angle glaucoma with significant lens change were included in the study. Group I: Pseudoexfoliation glaucoma 50 cases. Group II : Nonpseudoexfoliation glaucoma 50 cases.
Methods: Each patient underwent detail evalution, history, slitlamp, applanation, gonioscopy, funduscopy, perimetry.
Surgical technique: Phacotrabeculectomy was done with rectangular flap and 10-0 nylon suture was placed.
Main outcome measures: Surgical sucess was based on visual outcome, IOP control and well centred IOL.
Results: 1. There was pre-existing risk for complication in group I, like small pupil (80%) and zonular weakness (50%). 2. The postoperative mean IOP was similar in both groups. 3. Intraoperative complications were more in group I; stretch pupilloplasty with iris hooks was needed in 60%; capsule tension ring was placed in 50% of cases. 4. There was need to convert in 10% of cases, due to vitreous loss or subluxation.
Conclusion: 1. The surgical complications associated with group I were significantly high as compared to the other group. 2. The mean IOP was similar in both the groups at the end of one year.
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P446 RESULTS OF COMBINED PHACOEMULSIFICATION AND VISCOCANALOSTOMY IN PSEUDOEXFOLIATIVE CATARACT AND GLAUCOMA

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Objective: Combined phacoemulsification and glaucoma surgery has become an established method to control intraocular pressure (IOP) and achieve visual rehabilitation in patients with cataract and glaucoma. Phacotrabeculectomy has been demonstrated to be an effective method in patients with pseudoexfoliation glaucoma (PEXG) and cataract. However, complications were found to be more common in the PEXG patients. Tthis study evaluates the efficacy and safety of combined viscocanalostomy and phacoemulsification in patients with PEXG.
Patients and Methods: In this prospective noncomparative clinical trial, 11 eyes of 8 PEXG patients with cataract were included. Combined viscocanalostomy and phacoemulsification procedure was performed in all. IOP control, visual acuity, and complications were reported up to one year.
Results: The mean preoperative IOP was 18 ± 3.2 mmHg. At 1 year, the mean IOP decreased to 13.5 ± 2.7 mmHg. This postoperative mean IOP reduction was statistically significant ($p < 0.05$). All patients had at least 2 antiglaucoma agents before surgery for IOP control, whereas at follow-up only two patients (18%) needed a single antiglaucoma medication. The mean preoperative best-corrected visual acuity (pre-bcva) was 0.16, while the mean postoperative uncorrected visual acuity (post-ucva) and best-corrected visual acuity (post-BVCA) was 0.5 and 0.63 respectively. Complications included partial zonular dehiscence 1/11 (9%), total zonular dehiscence and vitreous prolapse 1/11 (9%), transient postoperative IOP spike 2/11 (18%). All of the complications were mild and transient.
Conclusion: Combined viscocanalostomy and phacoemulsification achieves excellent IOP control and visual outcome in patients with cataract and PEXG. Complication rate is very low.
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P447 SAFETY AND EFFICACY OF COMBINED PHACOEMULSIFICATION AND TRABECULECTOMY WITH LOW DOSE MITOMYCIN-C

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Purpose: There is generally a lower reduction in intraocluar pressure (IOP) with phacotrabeculectomy than with trabeculectomy alone. Reviews suggest that mitomycin c improves efficacy of combined phacoemulsification and trabeculectomy but increases the complication rate. We found that the studies using MMC have mainly used a higher concentration (04.to 0.5 mg/ml) which can cause the higher rate of complications. We present the results safety and efficacy of combined phacoemulsification and trabeculectomy with low dose mitomycin-c.

Design: A retrospective case note review was done of patients who underwent combined phacoemulsification and trabeculectomy with low dose mitomycin-c. The study was performed at a university hospital (Wolverhampton and Midlands Eye Infirmary, United Kingdom). The results were compared with the patients undergoing trabeculectomy with MMC in the same unit.
Participants: Thirty-nine patients who had a phacoemulsification and trabeculectomy with MMC over last five years and had a minimum regular follow up period of 12 months were included. Twenty-two patients who underwent a trabeculectomy with MMC were included.
Intervention: A two site combined phacoemulsification and trabeculectomy with low dose mitomycin-c or a standard a trabeculectomy with MMC was done.
Main outcome measures: Main outcome measures were intraocular pressure reduction, change in visual acuity, intraoperative and postoperative complications and number of postoperative visits and interventions required.
Results: The mean IOP reduction was 44.32% from a preoperative mean IOP of 28.3 (±10.3) mmHg to postoperative mean IOP at last follow-up visit of 12.9 (±3.36) mmHg. Snellen acuity improved or remained same in 94.9 percent of cases. No intraoperative complications or major postoperative complications were seen in this series. Minor postoperative complications like a small leak or hyphema were noted in a small number of patients and these could be easily and safely managed. The mean IOP drop was lower than that achieved in the patients undergoing only MMC augmented trabeculectomy (61.8%) but there was no significant difference in complications and number of postoperative visits required. Our results compared well with the previously published international studies.
Conclusion: Combined phacoemulsification and trabeculectomy with a low dose mitomycin-c was safe and effective in suitable patients.
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12.16. Surgical treatment: Vitrectomy

P448 SUTURELESS SINGLE PORT TRANSCONJUNCTIVAL LIMITED PARS PLANA VITRECTOMY COMBINED WITH PHACOEMULSIFICATION FOR MANAGEMENT OF CATARACTS WITH SHALLOW ANTERIOR CHAMBER AND HIGH INTRAOCULAR PRESSURE

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Purpose: To report the use of limited sutureless pars plana vitrectomy to decrease intraocular pressure (IOP) and deepen the anterior chamber prior to phacoemulsification in eyes with shallow anterior chamber and high IOP.
Design: Interventional case series.
Participants: Fifteen patients (8 with phacomorphic glaucoma, 3 with acute angle closure and 4 with chronic angle closure glaucoma) with a visually significant cataract were included.
Intervention: All patients underwent single port 23g transconjunctival sutureless limited pars plana vitrectomy prior to standard phacoemulsification surgery (figure 1a. Showing entry port being made with MVR blade, figure 1b. 23g vitrectomy cutter introduced in the eye with the trocar in place).
Main outcome measures: Parameters recorded included best corrected visual acuity, applanation intraocular pressure, intraoperative problems and trabecular iris angle (TIA) by ultrasound biomicroscopy (UBM).
Results: Mean age of the patients was 52.6 ± 8.4 years. Preoperative BCVA was <20/200 in all cases. Mean preoperative IOP was 41.6 ± 7.8 mmHg with a closed superior and inferior TIA in all eyes on UBM. All eyes underwent successful phacoemulsification with no intraoperative complications and implantation of a PMMA intraocular lens in the capsular bag. Mean postoperative IOP was 13.3 ± 4.2 mmHg on day 1, 14.2 ± 3.1 mmHg on day 7 and 14.6 ± 3.4 mmHg after 4 weeks. The mean superior TIA was 28.5 ± 9.6 and the mean inferior TIA was 31.2 ± 8.2 at 1 week follow-up. All eyes achieved a best corrected visual acuity of 20/40 or better at 4 weeks. Indirect ophthalmoscopic screening of retina and the sclerotomy site did not reveal any significant abnormality at 4 weeks.
Conclusions: Small gauge sutureless limited pars plana vitrectomy is an effective technique to reduce positive vitreous pressure, deepen the anterior chamber and facilitate phacoemulsification in eyes with high IOP and a shallow crowded anterior segment.
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P449 VITRECTOMY, PHACOEMULSIFICATION WITH IOL AND POSTERIOR APPROACH IRIDOTOMY (VPPI) FOR CATARACT SURGERY IN EYES WITH EXTREMELY SHALLOW ANTERIOR CHAMBERS.

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Objective: To present the initial results of a new technique of core vitrectomy with phacoemulsification and posterior approach iridotomy (VPPI) for performing safe cataract surgery for small eyes with phacomorphic angle closure and extremely shallow anterior chambers.
Design: An interventional consecutive case series study.
Participants: Six eyes of 6 consecutive patients presented with an acute angle closure attack with predominant phacomorphic element and extremely shallow anterior chambers.
Methods: A single port core vitrectomy, phacoemulsification with intraocular lens implant and then a posterior approach iridotomy at 12 o'clock was performed to prevent post-operative aqueous misdirection.
Outcome measures: Intra-operative and post-operative complications. Pre-operative and post-operative visual acuities, intraocular pressures and number of glaucoma medications.
Results: The mean age at surgery was 73 years. The mean axial length was 19.57 mm (range = 15.30 to 21.87mm), the mean anterior chamber depth was 1.67mm and the mean lens thickness was 5.14 mm. At 3 month follow up period, there was an improvement of a mean of 2.16 snellen lines. No eyes had reduced vision. The mean pre-op IOP was 23.67 mmHg with four patients on oral acetazolamide. The mean post-op IOP was 13.83 mmHg with only one patient requiring oral acetazolamide. There were no intraoperative complications. One patient developed transient vitreous haemorrhage which resolved spontaneously.
Conclusion: VPPI is an effective technique in safe removal of bulky cataracts causing phacomorphic angle closure in small eyes.
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12.20. Surgical treatment: Other

P451 ANTERIOR SEGMENT RECONSTRUCTION IN PROBLEMATIC CASES OF GLAUCOMA WITH ORGANIC ANGLE BLOCK
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POSTER WITHDRAWN

P452 AUTOGENOUS FASCIA LATA FOR REPAIR OF A TRAUMATIC FILTERING BLEB AND REINFORCEMENT OF THIN SCLERAL WALL
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Purpose: To present the clinical features and management outcome of a patient with filtering bleb formation following trauma.
Design: Interventional case report.
Methods: Case presentation.
Main outcome measures: Success of autogenous fascia lata in management of traumatic filtering bleb.
Results: Seventeen-year-old female patient presented with the complaints of blurred vision and mild pain. Visual acuity of the left eye was 20/200. The pupilla was distorted and pulled upwards; an elevated, gray-brown mass at the superior quadrant was noted. Aqueous outflow was readily evident over the mass. Gonioscopy revealed 2 to 3 clock hours of peripheral anterior synechia in the superior quadrant. Significant cortical opacities were present; intraocular pressure was between 14 mmHg. Ophthalmic examination of the right eye was within normal limits. The patient underwent repair of the filtering bleb with autogenous fascia lata, and subsequent phacoemulsification and intraocular lens implantation. Her visual acuity improved to 0.8, however, intraocular pressure was measured 42 mmHg one month after the surgery. Intraocular pressure remained high despite maximal medical treatment. Autogenous fascia lata over the ectatic area was well taken, however, the surgical site was still thin. Ahmed valve implantation was performed trying to avoid the thin scleral area along with autogenous fascia lata placed both under and over the tube. Intraocular pressure was well controlled between 6-10 mmHg without any postoperative complications during the follow-up.
Conclusion: Autogenous facia lata is a valuable graft readily available to the ophthalmic surgeon for both repair of filtering blebs and reinforcement of surgical sites in the presence of thin scleral wall.
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P453 PARACENTESIS IN ACUTE PRIMARY ANGLE CLOSURE INDONESIAN EYES
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Objective: To evaluate the intraocular pressure (IOP) after paracentesis in acute primary angle closure (APAC) in Indonesian eyes
Design: This study was analyzed prospective pre-post test.
Participants: Patients with APAC less than one month who had not respond well to anti-glaucoma medication were included.
Methods: We did a thorough eye examination and immediately performed a paracentesis on the day the patient was admitted to the hospital. One day after the paracentesis, a peripheral laser iridectomy was done as a definitive treatment, and finally, within 2 weeks time one of the following surgery was done, trabeculectomy for IOP above 25 mmHg and phacoemulsification for IOP 25 mmHg or lower. Outcomes were statistically analyzed using Wilcoxon and paired t-tests.
Main outcome measures: We examine initial, post paracentecis and post surgery IOP. Areas with peripheral anterior synechiae (PAS) and optic nerve were documented
Results: We did the paracentecis on 45 APAC eyes. One day after paracentesis, the IOP was decreased around 49% from initial IOP. It was statistically proven that the width of pas area and high IOP do not influence the result of the paracentesis. Average final IOP was 18 mmHg. Finally, we had 10 eyes with normal visual acuity and visual field, but average cup disc ratio was 0.7 with MD12.00 (Humphrey) of visual field.
Conclusion: Paracentesis is an effective procedure to reduce IOP in APAC patients who do not respond well with initial medications. Emergency procedure should be done in patients with APAC.
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P454 COMBINED DEEP SCLERECTOMY & CYCLODIALYSIS IN PRIMARY OPEN ANGLE GLAUCOMA
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Purpose: To evaluate the role of cyclodialysis when combined with deep sclerectomy.
Methods: Forty eyes suffering from POAG were randomly classified in 2 groups: Group A: included 20 eyes and were subjected to deep sclerectomy alone; Group B: included 20 eyes and were subjected to combined deep sclerectomy and cyclodialysis. The follow-up period was 6 months in both groups.
Results: The reduction in post-operative IOP was marked in group b. The suprachoriodal effusion was also marked in this group during the follow up period. In both groups, the visual acuity were stable and there was no assocciated shallownness of anterior chamber.
Conclusion: Combined deep sclerectomy and cyclodialysis may be more effective in controlling postoperative IOP in cases of POAG when compared with deep sclerctomy alone.

14. COSTING STUDIES; PHARMACOECONOMICS

P455 RELIABILITY OF DOSING, EASE OF ADMINISTRATION, AND DAILY COSTS IN GLAUCOMA COMBINATION THERAPY
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Purpose: Numerous studies have demonstrated the IOP-lowering efficacy of fixed combination ocular hypotensive agents. The purpose of this study was to assess dosing ease and reliability with Ganfort (bimatoprost 0.03%/ timolol 0,5%), Duotrav (travoprost 0.004%/timolol 0.5%), and Xalacom (latanoprost 0.005%/timolol 0.5%) fixed combination therapies and to estimate daily treatment costs in European countries.
Design: Pharmacoeconomic and drop size evaluation of three available combination therapies. Ease of use was also evaluated.
Participants: Two elderly patients.
Methods: Participants evaluated the number of drops of three alternative bottles of drugs on consecutive days and rated the ease of product handling. Drug prices were based on public prices (including vat) for 3-packs when available, otherwise for single packs. Daily treatment costs were calculated for the complete use of each bottle or for 1 month.
Main outcome measures: Number of drops in bottles, ease of product use, daily treatment costs.
Results: In no test was the drop count inferior to the number needed for 1 month of bilateral treatment. If products have to be discarded after 1 month, daily treatment costs are rather similar within countries, but differed between countries with a range of 0.62€ to 1.22€. Ganfort yielded the highest number of drops, 107±2.5, compared to 93±2.7 for Duotrav and 87±2.7 for Xalacom. As a consequence, it had the lowest daily cost in 7 of the 9 countries where all three products are available: Denmark, Finland, France, Germany, Norway, Sweden, United Kingdom. The difference to the next lowest (Duotrav) ranged from 6% to21%, and from15% to 47% to the most expensive (Xalacom). Duotrav was however the least expensive in Ireland and Xalacom in The Netherlands. Ganfort was also considered by all test persons to be the easiest to handle, while the Duotrav bottle was unanimously judged to be too hard.
Conclusions: Ganfort was easiest to handle and thus yielded the highest and most reliable number of applications leading to the lowest daily cost in most countries.

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P456 IS GLAUCOMA SCREENING COST-EFFECTIVE? A MODEL EVALUATING THE RELATIVE CLINICAL AND ECONOMIC IMPACT IN COMMERCIAL VERSUS SENIOR MANAGED CARE POPULATIONS IN THE USA.

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Objective: The literature suggests that there may be significant cost savings associated with the early identification and treatment of glaucoma as the cost to treat glaucoma increases with each stage of progression. It is the objective of this model to evaluate the potential return on investment (ROI) of a glaucoma-screening disease management (DM) program in commercial vs. senior managed care populations in the USA.
Design: An excel-based model was developed to assess the direct payer costs associated with screening and early treatment of glaucoma patients vs. a strategy of non-screening. Treatment costs and disease progression rates were taken from the published literature. Drug costs were based on average wholesale price cost with consideration of contractual discounts and patient co-payment.
Main outcome measures: The primary economic endpoint was the ratio of reduced annual treatment costs compared to annual program costs.
Results: In a commercial population, total annual costs to 'screen and treat' vs. a strategy of no screening are US$0.62 pmpm vs. US$0.80 pmpm respectively (US$0.12 pmpm in favor of screening). In a senior population, these costs are us$6.66 pmpm vs. US$7.94 pmpm respectively (US$1.28 pmpm in favor of screening). With estimated program costs of US$0.009 pmpm and US$0.167 pmpm in the commercial vs. senior populations respectively, the ROI is 2.6 and 1.7 for these programs.
Conclusions: Positive ROI for DM programs has generally been limited to those managing congestive heart failure or multiple disease conditions. Total annual costs for a glaucoma screening DM program in the USA are estimated to demonstrate a positive ROI in both commercial and senior managed care populations. The significant differences in annual costs by stage of disease combined with the relatively modest cost associated with developing a glaucoma screening program provides an explanation for the positive ROI attained. These findings may help promote the interest of payers in implementing pertinent quality improvement efforts.

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P457 EVALUATING THE BENEFITS OF TREATMENTS FOR OPHTHALMIC CONDITIONS USING COST UTILITY ANALYSIS. WHICH METRIC TO USE?

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Purpose: The national eye institute visual function questionnaire (NEI-FQ-25) is a tool designed to measure vision-targeted, health-related quality of life in clinical research1-5. The US panel on cost-effectiveness and nice in the uk have recommended that health outcomes in cost utility analyses should be weighted by the preferences of society and not patients. However, existing societal-based preference measures either do not include items on vision loss or include a limited assessment of visual functioning. Moreover, published info on the extent by which members of society with good vision judge the impact of vision loss on quality of life is limited. The objective of this research is to develop methods for capturing societal-based utility preferences regarding the impact of ophthalmic disease.
Design: Utility measure.
Participants: 3,500 unique patients with glaucoma, DME, RVO, uveitis, or ARMD will be presented, along with the methodology for utility elicitation from 800 members of the general public (n=200 per country).
Methods: The 25-item NEI-VFQ will be simplified via principal components analysis and item response theory using data from both observational and clinical studies. Exploratory item reduction will be stratified by peripheral versus central vision loss and via a pooled sample. Creation of visual functioning health states from the reduced items will include clinician review and patient interviews. Health utility valuations based on the health states will be collected from the public in Australia, Canada, UK and US.
Main outcome measures: VFQ responses.
Results: The need for such a utility measure for ophthalmic conditions and the development process will be described, and will include the pros and cons of alternative approaches to obtaining utility data. The simplified VFQ

based on analysis of >3,500 unique patients with glaucoma, DME, RVO, uveitis, or ARMD will be presented, along with the methodology for utility elicitation from 800 members of the general public (n=200 per country).
Conclusions: With limitations of existing utility measurement for ophthalmic conditions, a new utility measure based on the VFQ will provide necessary information for cost-utility analyses that are required by various health care payers and regulatory agencies.
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P458 SCREENING FOR OPEN-ANGLE GLAUCOMA (OAG): IS IT COST-EFFECTIVE?
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Objective: To assess whether screening for open-angle glaucoma (OAG) meets the UK national screening committee criteria.
Design: Systematic reviews and Markov modelling.
Methods: Two alternative screening strategies, and a pathway reflecting current case finding, were developed following wide consultation. Three Markov sub-models, estimating the lifetime cost and benefits were developed each representing one of the three strategies. All strategies allowed for progression of glaucoma. Model parameters were derived from a series of systematic reviews of the epidemiology, and screening effectiveness (test accuracy, and treatment effectiveness) conducted explicitly for the purpose.
Main outcome measures: Cost-effectiveness of screening expressed in terms of incremental cost per quality adjusted life year (QALY).
Results: In the UK, the estimated population prevalence is 2%, but varies from 0.3% to 3.2% in people aged 40 to 70 years. Incidence ranges between 30 and 181 per 100,000 person-years for ages 50 and 70 years respectively. Of an estimated half a million people affected, 65% are undetected. Prevalence was higher in myopes (2.7%), diabetics (3.3%), first-degree relative affected (6.7%). The risk is four times higher amongst those of african ethnicity.1 Most potential screening tests had an estimated specificity of 85% or higher. However, due to the strongly heterogeneous nature of the data and the relatively small number of studies it was not possible to conclude whether any one test was clearly superior. (1) Data on the long term risk of visual impairment were of poor quality. Utility with increasing severity was estimated as 0.80 (early), 0.75 (moderate), 0.71 (severe) and 0.53 for visual impairment. (2) Using these utilities population screening for a 40 year old cohort, with 1% prevalence had an incremental cost per qaly of £108,000 and a 1.2% chance of being cost-effective at a £20,000 willingness-to pay threshold. The main determinant of cost-effectiveness was prevalence. It is predicted that screening might be cost-effective in a 50-year-old cohort at a prevalence of 4% with a ten year screening interval. Cost-effectiveness was sensitive to the perspective on costs (NHS or societal), attendance for sight tests, progression rate and utilities. Cost-effectiveness was not particularly sensitive to the screening test accuracy within the ranges tested.
Conclusions: General population screening for OAG is unlikely to be cost effective. Selective screening of groups with higher prevalence (black ethnicity and family history) might be, although only 6% of the UK population would be eligible. These findings are based on an economic model whose parameter estimates have considerable uncertainty. If the rate of progression, utility loss and, or, costs of visual impairment are higher than estimated, screening would be more likely to be cost-effective. Further research is required to provide reliable data to refine the model.
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15. MISCELLANEOUS

P460 AWARENESS OF GLAUCOMA IN AN URBAN AND RURAL POPULATION IN PONDICHERRY STATE OF SOUTHERN INDIA.
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POSTER WITHDRAWN

P461 TRABECULECTOMY IN AFRICAN CARIBBEAN GLAUCOMA: THE PATIENT'S JOURNEY
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Purpose: To explore the experiences of secondary eye care services of African-Caribbean patients undergoing glaucoma filtration surgery.
Design: Qualitative, phenomenological, semi-structured interview.
Participants: Purposive sample of six patients; 2 female, 4 male; age range: 21-75.
Methods: Semi-structured interviews. Data analysis: content analysis and thematic induction using a combination of manual and computer aided methods.
Main outcome measures: Identification of key factors to facilitate reduction of health disparities and enhance cultural competence, optimise eye health outcomes, and reduce avoidable glaucoma blindness in the local African-Caribbean community.
Results: The patients' experiences and the roles of the surgical team were described in terms of archetypes of the 'mythic journey'. Patients emphasised the importance of a consistent team approach in relation to information giving, trust, humour and a positive outlook.

Conclusions: 'Relationship-centred ' care rooted in a participatory approach to service delivery and glaucoma research is fundamental to a quality experience for African-Caribbean patients in the secondary eye care system.

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P462 HOW THE PATIENTS DEALS WITH GLAUCOMA AND WITH THEIR DOCTORS IN BARCELONA.

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Objectives: To know the knowledge of the patients about their pathology. The complaince of treatments and their evaluation of medical control, the dosage and their accesibility to the medicine prescribed.

Design: We carried out a survey in 230 patients.

Participants: We have selected patients from a random sample obtained from the list of patient under glaucoma treatments (150 patients) and a second group of patients who participated voluntarily (80 patients), invited to an informative meeting anounced by posters in our medical center. The mean age was 71 yo (min. 43 and max. 93 yo).

Methods: They did an anonimous test, carried up together, at the same time, question by question, all this questions and answers were explained by the ophtalmologist who did after the test an informative speech. All the incomplete test or with mistakes were rejected. We got 123 useful test for this study.

Results: Half of the patients (49,6%) think that their ophtalmologist has given a good explanation of their pathology. About the same amount of patients did not know about the genetical aspect of glaucoma. Some of them (7,3%) even did not know their diagnosis. From these patients 49,6% did a visual field once in a year and were controlled one or two times in a year. Most of the patients say that they do not have any problem to remember to apply the drops and mostly do this themselves. Our patients do not have problems to get the medicine from their health care organisation. Half of them use only one eye drop. About one third of the patients think that it is more difficult to use more than one type of eye drops. Of our patients, 69,9% said that they do not forget to put the drops and 74% of them did not have adverse reactions to their medicines.

Conclusions: It is very necessary to insist in education of the patients about their pathology. This will result in the improvement of the complaince. It is necessary to give to the general opthalmologist guidelines for the follow up of glaucoma. The use of one or two eye drops is indifferent for our patients.

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P463 SELF-REPORTED BARRIERS AND STRATEGIES TO BETTER FOLLOW-UP AMONG GLAUCOMA PATIENTS IN SOUTH INDIA

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Purpose: To identify the barriers contributing to poor attendance of follow-up glaucoma examinations (FGES) in South India, and to develop strategies to combat these barriers and improve attendance of FGES.

Design: This is a prospective case-control study.

Participants: Three hundred established patients with primary glaucoma/ocular hypertension diagnosed atleast 12 months prior, with age over 40 years were enrolled.

Methods: Included 150 patients who did and 150 who did not attend follow-up glaucoma examinations (FGES) as advised in the past year. A medical record review was performed to identify patients who failed to attend at least one FGE in the past year. These patients were asked to identify significant barriers that prevented them from attending their FGE and were asked about various strategies, which would be most effective in increasing glaucoma awareness. Data were collected by a trained interviewer in the patient's vernacular.

Results: Of the 300 patients enrolled in the study, 226 (75.3%) patients failed to attend at least one FGE and collectively cited 405 barriers for an average of 1.8 barriers per person. Among 226 patients, 99 (43.8%) reported 'my eyes were okay' as a reason for not attending their FGE. The barriers were categorized as direct costs (8.4%), time/ inconvenience (18.8%), physical challenges (17.5%), incidental obligations (17.3%), and knowledge/perceptional barriers (38.0%). The best strategies to increase glauco-

ma awareness and screening: media advertising (30.2%), having a mobile glaucoma van (24.7%), and school education programs in which children later educate parents/ grandparents at home (23.3%).
Conclusion: Knowledge and perceptional barriers are the most common reason for patients failing to attend FGES, and despite current counseling efforts, many patients still fail to appreciate the importance of regular FGES in disease progression. Attention should be given to providing more effective counseling, which may reduce other classes of barriers. Medical fees, lost wages, and transportation difficulties were less important reasons for FGE non-attendance. Patients themselves prefer strategic interventions that reduce time and effort required to attend FGES and media advertisement is believed to be the most effective strategy in promoting glaucoma awareness.
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P464 RISK MANAGEMENT IN GLAUCOMA PRACTICE
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Purpose: Clinical governance and risk management is very important in today's clinical practice. Risk management, in its most basic form, is the process of making and carrying out decisions that will minimize the adverse effects of accidental losses.
Methods: Published literature on risk management in glaucoma practice was reviewed.
Results: This poster higlights the various strategies to prevent and reduce the adverse outcomes and thus litigations.
Conclusions: Glaucoma-related claims and lawsuits arise relatively infrequently. When they do, however, they are more likely to result in indemnity payments, and those payments are likely to be substantially larger than they are for other types of ophthalmic claims. Doctors alone do not have the authority to implement effective risk management in hospitals, but they can certainly bring their considerable influence to bear on hospitals to implement the range of activities that are described above.
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P465 THE AFRICAN DESCENT AND GLAUCOMA EVALUATION STUDY (ADAGES): BASELINE CLINICAL AND VISUAL FUNCTION FINDINGS IN HEALTHY EYES
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Purpose: To compare baseline clinical and visual field (VF) findings between healthy participants of African descent (AD; n=217) with those of European descent (ED; n=209).
Design: Prospective, longitudinal, multi-center observational cohort study.
Participants: Healthy participants of African descent (ad; n=217) and those of European descent (ed; n=209).
Methods: Adages is a prospective, longitudinal, multi-center observational cohort study of healthy, ocular hypertensive, suspect, and glaucoma participants (n=1,224). 852 eyes from 426 participants (362 from adages and 64 from the diagnostic innovations in glaucoma study (DIGS) were included if they had normal fundus exams, IOP <22 mmHg, and no evidence of glaucoma on masked review of stereophotographs. VF results were not used to classify eyes. Results from short-wavelength automated perimetry (SWAP), frequency-doubling technology perimetry (FDT), and standard automated perimetry (SAP), along with clinical measurements and risk factors were obtained. Categorical variables were compared using fisher's exact test and continuous variables with the t-test.
Results: There were no significant differences between groups in age, gender, presence of heart disease, family history, or IOP. A significantly (p< .004) higher proportion of AD had diabetes (pre-retinopathy) or systemic hypertension (p=0.003) than ED subjects, 6% AD vs.10% ED and 28% AD vs. 16% ED, respectively. Cup/disc ratio was significantly larger and CCT was significantly thinner for AD than ED. AD showed significantly worse MD and PSD VF indices than ED.
Conclusions: significant differences on all VF tests and a number of clinical findings between healthy eyes from persons of AD compared with those of ED may be important to take into account when interpreting results from patient eyes. These differences may be signs of early eye disease or true differences between the healthy groups. Adages and digs will be important for discriminating these two possibilities.
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P466 AUDIT OF GLAUCOMA CARE PATHWAY FOR PATIENTS ATTENDING GLAUCOMA CLINIC AT CLAYTON HOSPITAL

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Introduction: Glaucoma is a chronic potentially blinding disorder, which needs lifelong care once diagnosed. Conventionally all glaucoma, ocular hypertension and glaucoma suspects are managed within clayton hospital by ophthalmologists (hospital based care). With increasing number of patients there is a need to share care with suitably trained ophthalmic professionals i.e., optometrists and nurses either at hospital eye services (HES) or through a community-based care.
Aims: (1) To assess the feasibility of establishing a nurse/optom led stable glaucoma clinic. (2) To reduce the burden of glaucoma and its associated conditions on hospital eye services. (3) This audit will identify percentage of patients that can be followed up by optoms and nurses to start with and can be rolled out into primary care in near future.
Material and Methods: (1) It is a prospective analysis of patients attending consultant led glaucoma clinic at clayton hospital for 8 weeks. Data has been collected using a proforma. The proforma was designed to compliment the department of health guidelines on glaucoma care pathway. (2) Data collected being analysed using microsoft excel programme.
Results: Results of 407 patients showed approximately 29% of patients can be managed through nurse/optom led community based primary care.
Recommendations: (1) Patient-centered approach utilising increased activity of optometrists and nurses at HES. (2) Community care of stable glaucoma patients by omps and optometrists with special interest in glaucoma. (3) Re-audit, to complete the audit cycle, to be carried out in 12 months time to see if the recommendations implemented have had a positive impact on the service.

P467 TOTAL QUALITY MANAGEMENT AND ITS CONTRIBUTION TO GLAUCOMA DELIVERY TO NORTH AFRICAN'S PATIENTS

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Within the iso 9001 quality system of the 'clinique ophthalmologique de tunis', a quality process based on a glaucoma patient tracking system(GPTS) has been started on 2006 to detect and analyze no show patients and extended to non compliant patients.
The author describes the GPTS process, analyzes no show and non compliance early results and statistics and reports on corrective actions taken.
He demonstrates how total quality management may guide and document treatment strategy and improves the quality of care delivery to North Africans glaucomatous patients

P468 NEUROSURGICAL CASES IN GLAUCOMA CLINIC

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Objective: To highlight importance of perimetry and 3-dimentional examination of optic disc in diagnosing glaucoma.
Design: Non-randomised,case series,diagnosed by chance in Glaucoma Clinic of Eye Foundation Hospital, Lagos, Nigeria from 2002 2004.
Participants: Five case series.
Method: Patients were initially diagnosed normal tension glaucoma, had visual acuity, applanation tonometry, dilated fundoscopy with 78d lens, digital imaging of the optic disc and retina nerve fiber layer, perimetry and CT-scan or magnetic resonance imaging.
Main outcome measures: Clinically documented visual acuity, perimetry, optic disc imaging and CT-scan or magnetic resonance imaging.
Result: Visual acuity is affected earlier than the visual field. The degree of visual acuity and field loss was not compatible with optic nerve cupping. All were found to have compressive optic neuropathy with vague history pointing to such diagnosis. Three cases were pituitary adenomas,1 frontal lobe mennigioma,1 right temporal arachnoid cyst.
Conclusion: All visual field loss is not caused by glaucoma. The diagnosis of normal tension glaucoma should be made after radiological investigation.
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P469 QUANTATATIVE ANALYSIS OF PERIPAPILLARY RETINAL NERVE LAYER THICKNESS USING SCANNING LASER POLARIMETRY WITH A VARIABLE CORNEAL COMPENSATOR IN NORMAL CHILDREN

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Purpose: To determine the normative range for peripapillary retinal nerve fiber layer (RNLF) thickness measured with scanning laser polarimetry with a variable corneal compensator (GDXVCC) in a group of children compared to adults.
Methods: Sixty normal children (mean age 7.92.1 years; range 4-12 years) and 60 normal adults (mean age 51.210.5 years; range 28-72 years) were included. All subjects underwent a complete ophthalmologic examination and imaging with GDXVCC. The 15 parameters listed on the extended parameter table printout were considered in the

analysis. Differences between groups were compared using the Mann-Whitney test. Variations in GDXVCC parameters in relation to age were studied with linear regression analysis.
Results: The mean RNLF thickness in the children was slightly greater than the adults (58.35.4 ?M vs. 56.35.5 ?M; p=0.048). The mean RNLF thickness in the inferior sector (inferior average) was significantly greater in the children than in the adults (67.77.9 ?M vs. 62.76.7 ?M; p=0.001). The parameters: inferior maximum, TSNIT SD, normalized superior area and normalized inferior were also significantly higher in the children (p<0.05). Linear regression analysis for the various GDXVCC parameters in relation to age showed that the inferior average was the only dependant variable that significantly decreased with age.
Conclusions: The mean thickness and mean inferior thickness of the peripapillary RNLF measured with GDXVCC were significantly greater in the group of children than in the group of adults. This implies that the GDXVCC built-in normative database cannot be applied to results obtained in children. Our normative data ranges in normal pediatric patients can be beneficial in using and interpreting GDXVCC results in cases of optic neuropathies, like glaucoma, optic nerve atrophy, and pathologies causing optic disc cupping and RNLF thinning (as shown in the examples).

P470 COMPREHENSION OF THE POLYNYA CONCEPT IS NECESSARY IN ORDER TO UNDERSTAND WHY GLAUCOMATOUS VISUAL FIELD LOSS RECOVERS WHEN THE SPINE IS MANIPULATED

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Objective: To demonstrate that visual field defect in glaucoma could be due to a biological polynya and thus could be reversible.
Methods: A representative case history is presented, in which the visual field loss was attributed to a glaucomatous process as a result of glaucoma specialist opinion, fundal photographs, family history, and visual field assessments by both static perimetry and multi-focal, visual evoked responses.
Intervention: Outpatient spinal manipulation treatments were performed. Spinal manipulation therapy, with and without the aid of muscle relaxant anesthesia, has been regularly shown to produce visual field recovery in appropriate patients.
Main outcome measures: Following each outpatient spinal manipulation treatment, the visual field deficits recovered immediately, but had returned to the abnormal state on examination at the subsequent visit, usually one week later. This phenomenon was repeated until, after a number of such treatments, the visual field remained normal without the need of spinal manipulation therapy.
Discussion: Recovery of longstanding loss of vision presumes the presence of a quasi-permanent pathology in the nervous system, including the eye. Recently the 'biological polynya' concept has been described as a common form of quasi-permanent neurological pathology. Biological polynyas are not detectable by X ray, CT scan or magnetic resonance imaging.
Conclusions: Biological polynyas are obligatory and must occur if the capillary blood flow is reduced beyond a critical level. This means that glaucomatous visual field loss cannot be regarded as a permanent deficit until the presence of a polynya has been excluded. The recovery of vision in our patient with spinal manipulation, suggests that spinal manipulation resolves biological polynyas. This seeding experience recommends that a double blind, randomed controlled trial should be initiated, which compares the effect of spinal manipulation therapy and a control intervention, on matched groups of patients suffering from glaucomatous visual field deficits.
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P471 GLAUCOMA - IS IT STILL A DILEMMA IN THE 21ST CENTURY

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In all parts of the world, the glaucoma is a major public health problem and cause personal tragedy. There is a need to improve global human resources and to encourage development of strategies to achieve these goals.
The study of 5-year incidence of open angle glaucoma in Melbourne, Victoria, Australia from 1992 -1999 concluded that the incidence increase significantly with the age and the undiagnosed cases suggests the need to develop novel community screening strategies for glaucoma.
Methods for prognostic evaluation and monitoring of patients with glaucoma or suspected of having glaucoma have always led to controversy.
The Disc Damage Likelihood Scale (DDLS) can be used for diagnosing, staging, and monitoring the rate of change of the patient's condition assuring that the patient's treatment is rational and effective.
Glaucoma starting from the definition, unknown etiology for the primary cases, glaucoma suspect, ocular hypertension, early detection, diagnosis, and details of management are all controversial. But the DDLS7 and this study for early detection and target IOP are milestones in our understanding of many of the controversies keeping in mind that multiplicity means satisaction of none.
What is new?
The risk factors for getting glaucoma will channel into the resultant level of IOP and disc damage . So calculation of

the combined probability of getting glaucoma for these 2 factors alone will include all risk factors.
Accordingly people are classified after calculation of the probability of getting glaucoma into the following: Normal, Ocular hypertension, Possible, Probable, Highly probable and Definite. In this way the clinical intities of Normal, Ocular hypertension, Glaucoma suspect, Low tension glaucoma and Definite glaucoma cases are precisely digitized and diagnosed. The target IOP is related to the cup disc ratio. Accordingly the management is prescribed. The details of the tables of combined probability of IOP and C/D ratio and the table of the target IOP will be presented in details.

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POST-POSTERS

Post-Posters are posters that have been received after the closing date for posters and have consequently not been graded by the poster committee.
For various reasons, the program committee decided to include them in the poster abstracts. They are indicated by **PP**, followed by a **number** and **letter**. The number refers to the position in the classification system, the letter to the fact that this is a Post-Poster, i.e., a later addition. In the poster exibition they will be positioned according to number.

2. ANATOMICAL STRUCTURES IN GLAUCOMA

PP46A CENTRAL CORNEAL THICKNESS AND MEDICALLY UNCONTROLLED PRIMARY OPEN-ANGLE GLAUCOMA

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Objective: Current evidences have determined clearly the role of central corneal thickness (CCT) in progression and development of Primary Open-Angle Glaucoma, but its effect on the level of glaucoma severity remains uncertain.
This study was designed to expand the available knowledge about the relationship between central corneal thickness and glaucoma severity with comparing two medically controlled and medically uncontrolled glaucoma groups.
Design: A retrospective case-control study.
Participants and controls: Participants were thirty patients in study group. Thirty subjects also included as controls.
Methods: Patients with past diagnosis of open-angle glaucoma, who were seen at glaucoma clinic of Farabi Hospital, participated in this retrospective case ' control study. Patients in the case group were those with primary open-angle glaucoma that intra ocular pressure (IOP) reduction of their affected eyes with maximum dose of medications has not been sufficient and because of visual field loss with or without increased in cup-to-disc ratio, they had been got elected for trabeculectomy. The control group was containing patients with primary open-angle glaucoma whom their disease has been under control with medical treatment and they were not considered for glaucoma filtering surgery.
Main outcome measures: Central corneal thickness was measured by ultrasound pachymetry. The average of 5 CCT readings was recorded.
Results: Intra ocular pressure, visual acuity, cup-to-disc ratio, and number of medication had significant association with medically uncontrolled glaucoma. The mean central corneal thickness in case subjects was 547.4 µm and in controls was 544.4 µm (P = 0.71). In comparison between two groups, these variables had no meaningful relationship: age, gender, central corneal thickness, family history, smoking, hypertension, diabetes and visual field.
Conclusions: In this study, central corneal thickness had no meaningful association with medically uncontrolled open angle glaucoma. It seems, like some recent evidences central corneal thickness could not predict the level of glaucoma severity and this is contrary to well recognized ability of central corneal thickness to predict development of primary open-angle glaucoma.
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2.2. Anatomical studies in glaucoma: Cornea

PP46B CORNEAL HYSTERESIS, CORNEAL RESIATANCE FACTOR AND IOP COMPENSATED FOR CORNEAL EFFECTS IN NORMAL, OPEN ANGLE AND NORMOTENSIVE GLAUCOMA EYES

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Structured format: Observational chart review.
Aims: Prevailing methods of intraocular pressure (IOP) measurement cause systematic errors by corneal dimensions and biomechanical properties of the cornea. We measured intraocular pressure (IOP) by Goldmann equivalent IOP (IOPg), IOP compensated for corneal effects (IOPcc), corneal hysteresis (CH), corneal resistance factor (CRF) by Reichert's Ocular Response Analyzer (ORA) as well as central corneal thickness (CCT) to see if these metrics provide useful information in diagnosis and management of glaucoma.
Method: A total of 4667 consecutive ORA measurements in 990 subjects in a general ophthalmology clinic were reviewed. Bad ORA signals, eyes with cornel pathology, keratorefractive surgery, keratoconus, Fuch's corneal dystrophy were discarded. Diagnosis of glaucoma was established by presence of glaucomatous optic neuropathy determined by

morphological examination of retinal neurofiber layes and optic nerve morphology by Heidelberg Retinal Tomography with or without visual field defects. Randomly selected one eye of each subject was extracted for analyses. 733 normal eyes, 155 primary open angle glaucoma (POAG) eyes and 102 normotensive glaucoma (NTG) eyes were selected and IOPg, IOPcc, CH, CRF (in mmHg, abbreviated in result) and CCT were compared.

Results: Normal eyes had IOPg 15.10 ± 3.22 , IOPcc 14.89 ± 3.51, CH 11.19 ± 1.63, CRF 10.46 ± 1.75, CCT 542 ± 33 µm. POAG eyes had IOPg 26.5 ± 5.54 (range 21.1-47.8), IOPcc 25.3 ± 5.54 (16.5 -46.5), CH 8.8 ± 2.36 (2.4 -13.9), CRF 11.3 ± 2.05 (4.5 ' 17.4), CCT 553 ± 43µm (433 ' 622). NTG eyes had IOPg 14.4 ± 3.39 (5.6-20.2), IOPcc 19.8 ± 3.41 (10.7-27.8), CH 6.31 ± 1.14 (3.6 -8.4), CRF 5.96 ±1.09 (4.1 - 8.4), CCT 513 ± 39 (433-622) µm. CH and CRF of NTG eyes were significantly lower than those of POAG ($p<0.001$) and normal eyes ($P<0.001$) indicating low viscous damping and viscoelasticity of the cornea of NTG eyes. The difference between mean IOPg and mean IOPcc of NTG eyes (5.43 mmHg) were significantly higher than those of POAG and normal eyes ($P<0.001$).

Conclusion: NTG eyes had significantly thinner mean CCT of 517 µm with a wide range of variation. Not only thinner cornea, but low viscoelasticity of the cornea may cause erroneously low IOPg and Goldmann applanation tonometry values, confounding the IOP measurement values. This may cause delayed diagnosis and inadequate therapy in NTG eyes. Reichert's ORA seems to provide significant metrics in the diagnosis, therapeutic target setting and management of glaucoma, especially for normotensive variety.

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2.6.3. Anatomical structures in glaucoma: Aqueous humor dynamics, production, composition: Composition

PP51A DECREASE IN REDUCING POWER OF AQUEOUS HUMOR ORIGINATING FROM GLAUCOMATOUS RABBITS

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Purpose: To evaluate changes in the reducing power of aqueous humor (AH) with cyclic voltammetry (CV) and HPLC-EC.

Methods: NZW albino rabbits exhibiting a sporadic mutation causing bilaterally buphthalmus eyes were set for intra ocular pressure (IOP) and eye size measurements. AH was obtained under deep anesthesia according to ARVO rules for Animal Care. The study included 6 congenital born glaucomatous rabbits (CGR) and 6 normal rabbits (CON) age-matched.

The AH samples were analyzed by CV and HPLC-EC.

Results: CGR IOP was found to be significantly higher than in CON (33.5+1.1 mmHg and 14.2+1.0 mmHg respectively), the corneal diameter was 18.25 mm and 13.9 mm respectively.

CV analysis revealed two anodic currents representing two groups of low molecular weight antioxidant (LMWA).The two anodic potentials were equal for the two tested groups, indicating the same components of LMWA. The first anodic current of CGR was only 30% of the CON rabbits (2.11 vs. 7.17 µA/mg protein, t-test: $P<0.05$).As the main hydrophilic components of the first anodic current are known to be uric acid (UA) and ascorbic acid (AA) , they were analyzed for exact content by HPLC-EC method. The levels of UA and AA were significantly lower in the CGR rabbits when compared to CON group.

Conclusion: Changes in the reducing power, as indicated by CV analysis, of CGR AH, is probably a result of chronic oxidative stress caused by the glaucoma condition. The differences in the first anodic wave are mainly due to a fall in the concentrations of UA and AA

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3. LABORATORY METHODS

PP81B THE CALCIFICATION MARKER ALKALINE PHOSPHATASE (ALP) IS INCREASED IN THE TRABECULAR MESHWORK™ OF GLAUCOMA DONORS AND CELLS TREATED WITH GLAUCOMATOUS INSULTS

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Purpose: The third most abundantly expressed gene in the humanTM tissue is the inhibitor of calcification Matrix Gla (MGP). The enzyme ALP is a well established marker of osteogenic differentiation, also activated during pathological

vascular calcification and present in atherosclerotic plaques. In this study we sought to determine the presence of calcification markers in the TM tissue from glaucoma donors and in primary TM cells insulted by the glaucomatous associated factors dexamethasone (DEX) and transforming growth factor β2 (TGFβ2). We also investigate the effect of silencing MGP in the TM cells.

Methods: Anterior segments from post-mortem human eyes from 8 glaucoma and 9 age/race/gender matched normal individuals were perfused at 3 µl/min constant flow between 1-6 days. Average pressure at 24 h baseline was 18.2 ± 6.2 mmHg. Primary HTM cells were generated from surgical residual corneal rims. HTM cells at passage 4-6 were treated with 0.1 µM DEX for 7 days and with 1-3 ng of TGFβ2 for 3 days in serum-free medium. Dissected TM tissues and harvested cells were processed to assay ALP activity, genomic DNA (Hoechst) and RNA extraction. Transfection of MGP siRNA was accomplished by nucleofector electroporation. MGP, γ-carboxylase and 18S cDNAs were quantified by *Taq*-Man real-time PCR.

Results: The normalized ALP levels of TM specimens from normal donors was 7.3 ± 1.6 ALP/µg DNA (n=4) while that of the TMs from glaucoma donors was 37.0 ± 10.7 ALP/µg DNA (n=5) (p≤0.04). DEX and TGFβ2 induced significant upregulation of ALP activity in two HTM cell lines. Expression of genes encoding MGP and its activating enzyme γ-carboxylase were reduced in the glaucoma tissue -4.4 ± 1.7 and -20.5 fold respectively. Silencing MGP by siRNA resulted in a 197% increase in ALP activity.

Conclusions: The increased activity the calcification marker in glaucoma TMs might be indicative of an undergoing mineralization process during the development of the disease. The inhibition of calcification mechanism represented by the presence of active MGP appears to be compromised in glaucoma tissues.

PP77B FUNCTIONAL DELIVERY OF NAKED siRNA TO THE HUMAN TRABECULAR MESHWORK (TM) IN PERFUSED ORGAN CULTURES

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Purpose: To investigate whether naked siRNA molecules could be directly delivered to the perfused intact human trabecular meshwork tissue, whether this siRNA could silence a trabecular meshwork preferred gene and whether it could counteract the downstream effect of a deleterious agent (dexamethasone, DEX) by silencing its receptor.

Methods: Anterior segments from post-mortem normal human donors were perfused at 3.4 ± 0.3 µl/min-constant flow or 15 mmHg-constant pressure to stable baseline (outflow facility, *C* = 0.22 ± 0.19 µl/min/mmHg) (n = 14).
Commercial siRNAs were diluted in DMEM perfusion medium and used without coupling to transfection reagents ('naked'). Perfusion of Cy3-labeled siRNA was performed at 100 nM for 48 h followed by 24 h with DMEM
medium (2 pairs). Perfusions of Matrix GLA protein (MGP) siRNA (100 nM) (OD) and scramble-siRNA (control) (OS) were performed for 48 h (2 pairs). Perfusions of glucocorticoid receptor (GR)-siRNA (OD) and scramble-control (OS) were performed for 48 h and continued by adding 100 nM DEX to the perfusion media for an additional 24 h (2 pairs). Frozen sections of labeled anterior segments were analyzed by confocal fluorescence microscopy. Differential expression of GR, MGP, myocilin (MYOC), cornea-derived transcript 6 (CDT6) and 18S genes was determined by RT-*Taq*Man PCR on RNA extracted from dissected trabecular meshwork. Primary human trabecular meshwork cells were generated from single individuals and nucleofector transfected using program T-23. Levels of secreted MYOC in the effluents were analyzed by western blot.

Results: Histological evaluation of anterior segments perfused with Cy3 labeled siRNA followed by unlabeled medium showed intense fluorescence in the trabecular meshwork region. MGP gene expression was silenced in the trabecular meshwork perfused with naked MGP siRNA. MGP transcripts were reduced -19.1 ± 2.2-fold (individual #3) and -15.5 ± 0.3-fold (individual #4) from those present in the contralateral eye perfused with scramble control. Pre-treatment of GR siRNA followed by DEX treatment caused a reduction of the MYOC and CDT6 gene expressions when compared with eyes pretreated with scramble-control (fold changes: -141.5 ± 1.5 and -37.5 ± 3.5, respectively for individual #5 and -11.3 ± 2.7 and -7.0 ± 0.4, respectively for individual #6). Western blots revealed the decrease of MYOC secreted by GR siRNA treated cell and organ cultures.

Conclusions: Readily available siRNA can be delivered to the intact human trabecular meshwork by intracameral perfusion. The delivered naked siRNA is functional, inhibiting not only the targeted gene but their downstream effectors. This functional intracameral delivery might be of use to protect the trabecular meshwork from unwanted insults and could have important therapeutic applications.

PP81C SELF-COMPLEMENTARY ADENO-ASSOCIATED VIRUSES (SCAAV) TRANSDUCE ANTERIOR SEGMENT TISSUES OF LIVING RATS AND MONKEYS WITHOUT DETRIMENTAL SECONDARY EFFECTS

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Purpose: Recombinant AAV viruses produce stable expression and elicit low immune response. scAAV are modified AAV which bypass the required second strand DNA synthesis to achieve transcription of the transgene. In contrast to conventional AAV, scAAV are able to transduce human trabecular meshwork (TM) in cultured cells and perfused organ cultures. Our goal is to obtain optimal, non immunogenic delivery of transgenes to the TM in a living system. Our purpose was to investigate scAAV transgene transduction in living rodents and non human primates.

Methods: scAAV.GFP vector was prepared at the UNC vector core facility. Wistar rats received single dose intracamerally injection (6-8X109 viral particles, VP) of scAAV or vehicle. Intraocular pressures (IOP) (calibrated Tonometer and Tonopen) were taken at baseline and once a week thereafter. Animals were euthanized at 2, 5-7, and 9-10.5 wks post injection and their anterior segments processed for fluorescence histochemistry. Two cynomolgus monkeys received transcorneal injection of a 30 µl single dose (3X1010 VP).

Follow-up examinations included IOP (Goldmann), slit lamp biomicroscopy, gonioscopy, fundus camera and microscope/cooled-CCD camera photography to detect GFP fluorescence.
Results: Rats: scAAV injected eyes showed no clinical signs of inflammation or cataract formation. Whole mounts and cryosections showed intense GFP transduction to the iris, TM, and some corneal endothelium. Successful, GFP positive injections occurred in all eyes at 2 wks, in 13 out of 14 at 7 wks, and in 17 out of 18 at 2.5 months (last point tried). Delta-IOP values were not significantly different from baseline and/or from eyes injected with vehicle. Monkeys: At abstract submission, 2 wk post-injection, in vivo gonioscopic examination revealed strong fluorescence in the anterior ciliary muscle / iris processes / uveal meshwork, and in the pupillary iris sphincter in both animals. Slit lamp biomicroscopy revealed no visible inflammatory reaction in the scAAV treated eyes. IOP measurements remained similar between the eyes. Further follow-up over the next few months will be presented.
Conclusions: scAAV is the first adeno-associated vector shown to transduce the living animal iris and trabecular meshwork. Because of the long term, non immunogenic transgene expression history of AAV vectors in eye diseases of the retina, scAAV holds good promise for developing gene transfer/gene therapy regimens to the TM.

PP81D UPREGULATION OF NTPDASE 1 IN AN EXPERIMENTAL MONKEY GLAUCOMA MODEL

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Purpose: ATP is released in numerous tissues to signal a change in flow, pressure or other mechanical perturbation. The increased intraocular pressure that can accompany glaucoma may also trigger the release of ATP. Retinal ganglion cells die in glaucoma, and stimulation of the P2X7 receptors for ATP can kill ganglion cells. Elevated pressure increases the concentration of ATP in the vitreous chamber of the bovine eyecup. Direct measurements of ATP levels in the extracellular space of the retina are not presently possible. However, we have recently found that the enzyme ecto-nucleoside triphosphate diphosphohydrolase 1 (NTPDase1; aka CD39) is upregulated after prolonged exposure to extracellular ATP. This study asked whether expression of the NTPDase1 was increased in the retinas of primates with elevated intraocular pressure (IOP).
Methods: Elevation of IOP was induced in one eye of 15 monkeys by laser photocoagulation of the trabecular meshwork. The IOP was monitored weekly; IOP values are the mean measurement throughout the experiment. For immunoblot experiments, eyes were fast frozen, retinal proteins purified using standard techniques and run on a SDS-PAGE. Gels were blotted with antibodies to NTPDase1(BU61) and staining quantified with Image Pro Plus software. For immunohistochemical studies, tissue was perfused with 2% paraformaldehyde, sectioned at 12 µm and processed using the same antibody as above.
Results: The IOP of the lasered eyes was significantly higher than the non-lasered controls, at 21.8 ± 1.2 mmHg vs. 15.6 ± 0.4 mmHg, respectively ($p<0.01$). Expression of NTPDase1 was also increased in the lasered eyes. Western blot analysis gave the mean ratio of protein in lasered vs non-lasered (L/NL) eye as 2.00 ± 0.28 (Mean ±SE). There was a significant correlation between the IOP and the increase in NTPDase1 protein in the glaucomatous retina ($r2 = 0.714$). Immunohistochemical analysis indicated that the upregulation of NTPDase1 occurred both in the inner nuclear layer and the optic nerve.
Conclusions: We have demonstrated that NTPDase1 levels are increased in the inner nuclear layer and optic nerve head of eyes with increased intraocular pressure. This result provides indirect evidence for chronic exposure to excess extracellular ATP in experimental glaucoma.

3.13.2.2. Laboratory methods: *In vivo* imaging: Optical coherence tomography: Posterior segment

PP90A STRATUS OCT 3 SCANNING RESOLUTION: FAST SCANS VS NORMAL SCANS IN MONKEYS

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Purpose: To evaluate the feasibility of using the Stratus OCT system with monkeys and investigate quantitative differences in fast vs normal (higher resolution) scans.
Methods: Normal eyes from 11 cynomolgus monkeys were studied. Monkeys were anesthetized with a combination of intra-muscular ketamine and medetomidine, followed by inhalation isoflurane. Slit lamp exams were performed prior to scan acquisition. A 10 mm plano contact lens was applied to ensure adequate corneal hydration. A Stratus OCT 3 system (Carl Zeiss Meditec, Dublin, CA) was used to acquire retinal nerve fiber layer (RNFL) map, RNFL thickness, macular thickness maps (Mac Map) and optic disc scans. Both fast and normal scans were taken during the same imaging session. Data are shown as mean±;sem, microns.
Results: Mac Map and RNFL (3.4) values varied little between scan types. RNFL map values were higher in the fast scans but not significantly so. Optic disc scans showed the most variability, with both scan types subject to errors detecting the edge of the RPE and the anterior surface of the RNFL. Mac Map: Mean quadrant values were 250.3±5.05 and 250.87±4.82; total macular volume measurements were 6.97±0.07 and 7.00±0.07; mean coefficient of variation (COV) for the quadrant values was 0.06±;0.0022 and 0.06±; 0.0023; signal strength (Sig. St.) was 9.77±0.11 and 9.73±0.15 for normal and fast scans respectively. RNFL Map: Data output was in the form of 8 sector values around the disc, with both inner and outer values. Fast scans averaged a non-significant 4.47±0.75 higher for the outer and 4.10±0.92 for the inner sectors. Mean COV for the 8 inner and 8 outer RNFL values, was 0.14±0.011 and 0.16±0.013 for normal and 0.15±0.013 and 0.18±0.014 for fast scans. Mean Sig. St. was 9.36±0.18 and 9.41±0.17 for normal and fast scans respectively. RNFL (3.4): Average thickness values were

99.26±1.95 and 100.43±1.65; mean COV was 0.12±0.01and 0.12±0.02; Sig. St. was 10.0±0.0 and 9.86±0.07 for normal and fast respectively. Optic disc: COV ranged from 0.11 to 0.79 with means of 0.39±0.05 and 0.45±0.06 for normal and fast respectively. The highest COV was seen in the parameter cup/disk area ratio, 0.73 and 0.79, while the lowest was seen in the parameter disk area, 0.11 and 0.12, Sig. St. was 9.64±0.12 and 9.55±0.18, normal and fast respectively.
Conclusions: Although the higher resolution of the normal scans may reveal more qualitative anatomic details, both the fast and normal scans produced comparable quantitative measurements in these normal, healthy monkeys.

6.9.1.2. Clinical examination methods: Computerized image analysis: Laser scanning: Confocal scanning laser polarimetry

PP177A STRUCTURE-FUNCTION RELATIONSHIP IN SCANNING LASER POLARIMETRY WITH ENHANCED CORNEAL COMPENSATION VERSUS VARIABLE CORNEAL COMPENSATION

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Purpose: To compare the structure-function relationship between the peripapillary retinal nerve fiber layer (RNFL) retardation, measured with scanning laser polarimetry (SLP) with both enhanced corneal compensation (ECC) and variable corneal compensation (VCC), and visual field (VF) sensitivity in normal and glaucomatous eyes; and any effect of atypical birefringence patterns (ABP) on this relationship.
Methods: Thirty-three healthy, and 68 glaucomatous eyes were imaged with both ECC and VCC; standard VFs were tested with Humphrey Field Analyzer. The relationships between local and global RNFL retardation, and VF sensitivity in matching VF areas1 were assessed in all eyes, and in eyes without ABP (n = 60).
Results: In all eyes, the structure-function relationships (Spearman's correlation coefficients, rs) were generally stronger with ECC than with VCC. In eyes without ABP, the relationships were similar for ECC and VCC (Table).
Conclusions: The structure-function relationship between RNFL retardation and VF sensitivity was stronger in images obtained with ECC than with VCC. ABP, more often seen with VCC than with ECC, weakened the structure-function relationship.
Reference:
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PP176B DIAGNOSTIC ACCURACY OF SCANNING LASER POLARIMETRY WITH ENHANCED VERSUS VARIABLE CORNEAL COMPENSATION

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Purpose: To determine the diagnostic accuracy of scanning laser polarimetry (SLP) parameters obtained with enhanced corneal compensation (ECC) versus variable corneal compensation (VCC), and any effect of atypical birefringence patterns (ABP) on this diagnostic accuracy.
Methods: Forty-one healthy and 92 glaucomatous eyes were imaged with both VCC and ECC. For both ECC and VCC, the areas under the receiver operating characteristic curves (AUROC), and the sensitivity at a specificity of ≥ 95% were calculated per parameter in all eyes and re-calculated in eyes without ABP images.
Results: With ECC, the diagnostic accuracy for most standard parameters in all eyes was statistically significantly higher with ECC than with VCC, except for the Nerve Fiber Indicator (NFI). After removing the eyes with ABP from the analysis, the diagnostic accuracy of SLP parameters with VCC improved to a similar level as with ECC (Table).
Conclusions: With ECC, the diagnostic accuracy was generally higher than with VCC, probably due to less ABP in ECC. The NFI performed, however, equally well for VCC and ECC, regardless of any ABP.

6.9.2.2. Clinical examination methods: Computerized image analysis: Optical coherence tomography: Posterior

PP212A CORRELATION BETWEEN RETINAL NERVE FIBER LAYER THICKNESS BY OPTICAL COHERENCE TOMOGRAPHY AND AUTOMATED PERIMETRY IN GLAUCOMA.

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Objectives: The major aims of this study were to determine the structure-function correlation between retinal nerve fiber layer (RNFL) thickness using optical coherence tomography (StratusOCT), and visual field testing in perimetric glaucoma, and to evaluate the discriminating ability of RNFL thickness in distinguishing early glaucoma from normal eyes.
Methodology: Subjects were recruited from the pool of patients attending the glaucoma outpatient clinic and from volunteers among the clinic staff and medical students. Sixty-nine left eyes were included in this study, with a total of 45 glaucomatous eyes and 24 normal eyes. All subjects underwent Fast RNFL thickness scanning using Stratus-OCT and performed central 24-2 threshold visual field test using Humphrey Visual Field Analyzer II.
Results: There was moderate correlation between average retinal nerve fiber layer (RNFL) thickness and the mean deviation (MD) in glaucoma (Pearson correlation r = 0.567, p<0.001). The structure-function correlation was significant although modest between the superior and inferior peripapillary quadrants, and the corresponding zones on the visual fields (r = 0.368 and r = 0.449 respectively; p<5% in both). The RNFL thickness in the inferior quadrant had the best discriminating ability to detect early glaucoma (defined by mean deviation of -6dB or better) from normal eyes (AROC=0.764, p=0.001).
Conclusions: There is moderate correlation between average RNFL thickness and mean deviation of visual fields in perimetric glaucoma. The RNFL thickness in the inferior

quadrant has the best discriminating ability in detecting early glaucoma.

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8.1. Refractive errors in relation to glaucoma: Myopia

PP237A THE VISUAL FIELD ANANLYSES IN PRIMARY OPEN ANGLEGLAUCOMA WITH HIGH MYOPIA

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Objective: To find whether the visual field changes are different between primary open angle glaucoma (POAG) with high myopia and POAG without it. To evaluate the relationship between damages of visual field and retinal nerve fibre layer (RNFL) thickness.
Design: Retrospective, case-controlled study.
Participants: A POAG-group with high myopia (21 eyes of 17 cases), a POAG-group with non-high myopia (17 eyes of 16 cases), a high-myopia group without POAG (25 eyes of 20 cases), and a normal contrastive group (19 eyes of 17 cases).
Methods: The static central visual fields were tested by Humphrey 750 automated perimetry and the thickness of RNFL was measured by optical coherent tomography (OCT).
Main outcome meaures: The characteristic of visual field among four groups of cases in total deviation probability plots mean deviation (MD), pattern standard deviation (PSD) and mean sensitivity in upper side, lower side, nose side and temporal side. Thickness of RNFL in upper side, lower side, nose side and temporal side. The relationship between damage of visual field and retinal nerve fiber layer thickness in every quadrant of every group was analyzed.
Results: There were more obvious general depression of sensitivity in total deviation probability plots of the early POAG with high myopia than that of POAG without high myopia, and the early visual field defects of glaucoma in pattern deviation probability plots of this group. MD of POAG with high myopia was more than those of others (P=0.05). The differences of MD, PSD and mean sensitivity between POAG with high myopia and others were significant (P=0.05). Mean sensitivities in each quadrant of POAG without high myopia were similar to those of high myopia (P=0.05). The thickness of RNFL of POAG with high myopia was thinner than that of others and the thickness of RNFL of normality was thicker than that of others. The correlationship between mean sensitivity and the thickness of RNFL in each quadrant was significant (P=0.05).
Conclusion: Pattern deviation probability plots is an important favor for judgement of the visual field changes in POAG with high myopia and the characteristic of it was extension and outer movement of physical scotoma. Measurement of RNFL thickness by OCT is very useful in detecting early RNFL damages of POAG with high myopia. Furthermore, the relationship between RNFL thickness and visual field damage may provide clinically relevant informations in diagnosis of POAG with high myopia.

9.2.3. Clinical forms of glaucomas: Primary open angle glaucomas: Open angle glaucoma with elevated IOP

PP247A CYTOKINE PROFILE OF TEAR IN PATIENTS WITH PRIMARY OPEN ANGLE GLAUCOMA

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Introduction: In the pathogenesis of primary open angle glaucoma (POAG) genetic factors, eye microgemocirculation disturbances, vascular, neuroendocrinal, metabolic disturbances, formation of dystrophic changes of drainage system, hydrostatics and hydrodynamics of the eye, metabolic disturbances are of major importance. There has been revealed the role of a number of immune disturbances in the pathogenesis of primary glaucoma (Stukalov et al., 1989). At the same time these questions require further study as the etiology of glaucoma has not been revealed yet as well as the pathogenetic mechanisms of its formation need to be studied in details.
Purpose: To study the cytokine profile of the tear in the patients with POAG.
Material and methods: Fifty-three patients with bilateral POAG aged 53 - 76 years were examined (24 males and 29 females).The I stage of glaucoma according to Nesterov-Bunin classification (1972) was diagnosed in 27 patients, II stage - in 18, and the III stage - in 8 patients. Intraocular tension in all patients was compensated by pharmacotherapy. The interleukin concentration (the TNF, IL-1, IL-4) in the tear was measured with the help of Sanofi Diagnostic Pasteur (France) labware.
Results and discussion: In the tears of POAG patients a rising concentration of proinflammatory cytokines was observed, at that the level of TNF raised at the I stage on average to 142±2,6 pg/ml, or in 1,3 times as compared to the norm; at the II stage - to 164±3,2 pg /ml, or in 1,5 times (II stage), at the III stage - to 181±2,9 pg /ml, or in 1,6 times as compared to the norm. IL-1 level raised to 121±1,8 pg /ml (I stage), to 148±1,3 pg /ml (II stage), and to 159±2,1 pg /ml (III stage) which was respectively 1,2; 1,5 and 1,6 times higher than the norm. The level of IL-4 anti-inflammatory cytokine decreased moderately: at the I stage of POAG it remained within the lower norm limits - 32,4±2,1 pg /ml, at the II stage it decreased on average to 29±1,2 pg /ml, or 1,2 times lower than the norm, at the III stage - to 20±1,5 pg /ml, or in 1,7 times lower the norm.

Conclusions: In POAG patients the disturbance of the cytokine profile of the tear in the form of proinflammatory cytokines (the TNF, IL-1) level rising and anti-inflammatory (IL-4.) level falling was found. The obtained data is the evidence of participation of immune disturbances in POAG pathogenesis.

9.2.4. Clinical forms of glaucomas: Primary open angle glaucomas: Normal pressure glaucoma

PP251A POTENTIAL BENEFICIAL EFFECT OF STATINS IN PREVENTING DISEASE PROGRESSION IN PATIENTS WITH NORMAL TENSION GLAUCOMA

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Objective: Studies have shown that Normal Tension Glaucoma (NTG) is a prevalent disease: in the Beaver Dam Eye Study, 31.7% of the glaucoma subjects have intraocular pressures (IOP) in a statistically normal range. The prevalence of NTG was reported to be 61% of glaucomas in Singapore and as many as 92.2% in Tajimi City, Japan. Statins are a mainstay of treatment for hypercholesterolemia. In a recent large study with Statin, it has shown to be useful for stroke prophylaxis. A previous study demonstrated a potential beneficial effect of Statin in preventing VF progression in open-angle glaucoma and hence may be associated with a reduced risk of open-angle glaucoma. The aim of this study was to investigate the potential effect of Statins on disease progression in NTG, employing multivariate analysis.
Participants: A retrospective analysis of 353 NTG patients.
Methods: Use of statin was documented via the computer system and from patients.
Main outcome measures: Disease progression in terms of visual field changes.
Results: On univariate analysis, use of Statins (p = 0.039) was associated with stable disease. Advancing age, presence of disc haemorrhage (DH), larger fluctuation of IOP, thin central corneal thickness (CCT) were associated with disease progression. On multivariate analysis, Statins was not associated with disease stabilization, while DH, CCT and IOP fluctuation amplitude were associated with progression.
Conclusions: Statins appeared to be associated with slower progression in univariate analysis. DH and CCT were two very strong factors that appeared to influence treatment outcome. A randomized controlled trial for Statins on disease progression is warranted.
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12.8.2. Surgical treatment: Filtering surgery: With tube implant or other drainage devices

PP392A THE TRIANGLE TENOTREPONATION TECHNIQUE IN NON-FILTERING BLEB IN PATIENTS WITH AHMED VALVE IMPLANT

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Purpose: To show the efficiency of the developed complex of surgical actions on reconstruction of a filtrational zone as a technique of reoperation at unsuccessful outcomes after implantation of the valve of Ahmed (AV).
Material and methods: Clinical researches have been lead at 32 patients in the age of from 18 to 42 years, with AV implanted. From this patients 9 (28,2) women and 23 (71,8) men. At 18 (56,3) patients the valve has been implanted in supratemporal quadrant, and at 14 (43,7) patients in supranasal quadrant. Average value of IOP in a month after operation was 34,82 mmHg. Implantation of the valve at patients was made on standard surgical technic in subtenone space. Patients have been divided on two groups: The first group included persons with triangle tenotreponation (TTT) surgery performed (method offered by us), the second group included patients with repeated needling procedure on bleb with aspiration of the filtered liquid and application of metamecin C 0.02%. At all patients the biomicroscopy, tonometry, perimetry and funduscopy was performed.
At patients of the first group TTT operation was made the average in a month after implantation of the valve. The technic of the operation is following: After a cut of conjunctiva in the limb, we making an exposure of bleb, then three cuts of tenone sized 4 mm crossed in the center, located under a corner of 120°, further on distance of 2 mm from the center of the basis of each of developed triangles we providing the suture through tenone layer and after that we provide the needle through top of each of triangles and returne it to initial point. Then we tighten ends of suture, and body of triangles turned under subtenone space. We make this procedure on each of triangles separetly. After the procedure the central tenotomy triangle in the sizes 5-6 mm is ready. The space washed by a metamecin C 0,02 %. Further conjunctiva sutured, injection of antibiotic is facultative.
Results: Operation and the postoperative period have passed without complications. Decreasing of IOP without application of hipotensive drops was possible to achieve in 87,3% cases, parallel application of hipotensive drops was required in 6,4 % cases, and repeated operative procedure was required in 6,3% patients. In 10,2% of patients in the early postoperative period the hypotonia was observed and it was spontaneously stoped for 5 day after operation. Dynamics of IOP in the postoperative period in both groups is given in table 1.
Conclusion: In analyzing of obtained data it is possible to make the conclusion, that the offered surgical technic of TTT at patients with IOP increase related with bleb after implantation of AV, is a less traumatic and an effective method of

creation of additional ways of outflow from bleb and can be applied in a clinical practice.

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PP392B EFFECT OF A NOVEL GLAUCOMA DRAINAGE DEVICE ON RABBIT EYES

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Objective: To observe the intraocular pressure (IOP) change and complications in vivo after implantation ATDS on rabbit eyes.

Design: randomized, case-controlled, experimental study. ATDS is a new glaucoma drainage device, which has four functional parts: 'T' shaped tube with lots of micropores distributed, plate, pool and pressure confined system(PCS). Proved by hydrodynamic tests, PCS can control aqueous humor outflow as a one-way valve.

Participants and controls: Ten eyes of 10 rabbits were participated as experimental group, and another 10 eyes were as controls.

Methods: Ten ATDS were implanted into left /right eyes of 10 healthy rabbits, and another 10 healthy rabbits, as controls, were obtained trabeculectomy by leaving one eye of each animal unoperated.

Main outcome measures: At 0, 3, 7, 14, 21, 28 days postoperatively, observed bilateral IOP by Perkins tonometer, nick leakage by Seidal test, responses of anterior segments of eyeball by slit lamp. The reject reactions includes cornea edema, shallow anterior chamber, Tyndall sign, local opacity of lens, neovascular, bleeding, exudation and the site of tube. At 14, 21, 28 days after surgery, Inspect the anterior segments, filtration blebs and position of ATDS by ultrasound biomicroscopy. At 28 days, ATDS eyes were enucleated, we observed blockage of 'T' shaped tube and appearance of fibrous layer.

Results: There was no significant difference between bilateral preoperative IOP of all rabbits (left:15.612±0.765 mmHg,right:15.503±0.827 mmHg. P>0.05, n=20), and the same between the two observed groups (P>0.05, n=10). In the experimental eyes, IOP dropped stably to the lowest point (9.080 mmHg) two weeks after surgery, and then went up slowly. At 28 days after implantation, IOP was still lower than that of pre-operation. Significant difference can be seen between the two groups at every study point (table 1). No incision leakage happened in ATDS group, and less reaction of anterior segments of eyeball than the controlled group (table 2). No tube shift, escape or be blocked in ATDS eyes (image 3). In the nucleated eyes, fibrous cysts can be seen around the plate (image 4).

Conclusions: In this short-term study, ATDS can effectively control aqueous humor outflow at certain pressure, with less complications. A fibrous cyst has formed around the plate and aqueous humor can diffuse through it.

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12.14. Surgical treatment: Combined cataract extraction and glaucoma surgery: Phacoemulsification

PP447A HYPOTONY ONE DAY AFTER SURGERY AS A PROGNOSTIC FACTOR IN FACOEMULSYFICATION COMBINED WITH DEEP SCLERECTOMY

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Purpose: The influence of hypotony on the evaluation of the efficacy of cataract facoemulsification with deep sclerectomy, using sk-gel implant in patients with open angle glaucoma in 15 months observation.

Materials and methods: Retrospective analysis was performed on 147 eyes in 123 patients with primary or secondary open angle glaucoma. Evaluation of DBCVA, IOP, anterior chamber and fundus was done before surgery and on day one after surgery. Subsequent post-op tests were done on day 7, 30, 60, 90, 180, 360 and 450. The studied population was divided into two groups based on hypotony on day one or lack of it. The division criterium was set at the level of 6 mmHg based on hazard cofactor close to 1.0. In group I (IOP <=6 mmhg) were 54 eyes (36.7% of all cases) and in group II (IOP >6 mmHg) were 93 eyes (63.3% of all cases). Complete and qualified surgical success rate was accepted as decrease in intraocular pressure to the level of ≤12, 15, 18 mmhg without glaucoma or with medications. Variance analysis and survival analysis was done with kaplan-meier method with the use of log rank test and regression was analysed with Cox's proportional hazard.

Results: The mean IOP was in group I 23.0 ±7.1 mmhg before surgery and was decreased by 77% to 5.3 ± 0.9 mmHg (p<.001). After 15 months the mean IOP was 12.9 ± 2.0 mmHg and was lower by 43.9% (p<.05). The mean values of IOP in group II were 22.6 ± 2.5 mmHg before surgery, decreased on day 1 after surgery by 44.7% to the level of 12.5 ± 4.7 mmHg (p<.001). At the end of observation the IOP was 12.9 ± 1.6 mmHg and was decreased by 42.9% (p<.05). At the end of observation qualified success rate for criterium ≤18.0 mmHg was achieved in 98.9% of cases in group I and 92.6% of cases in group II (p=.067). In the case for criterium ≤15 mmHg in group I 79.1% and group II 58.5% (p=.000) and for criterium ≤12 mmHg in group I 30.2% and 19.9% in group II (p=.000). Complete success rate after 15

months of observation for criterium ≤18 mmHg was achieved in 98.8% in group i and 84.3% in group II (p=.010), for criterium ≤15 mmHg in group I 79.1% and in group II 53.5% (p=.000) and for criterium ≤12 mmHg in group I 29.9% and in group II 19.4% (p=.000). At the end of observation there was no statistical difference in visual acuity between both groups (p>.05).
Conclusions: Hypotony one day after surgery is essential, positive, prognostic factor in remote results in case of facoemulsification performed simultaneously with deep sclerectomy.
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12.16. Surgical treatment: Vitrectomy

PP449A COMPARISON OF INTRAOCULAR PRESSURE CHANGES AFTER PARS PLANA VITRECTOMY COMBINED WITH OR WITHOUT SIMULTANEOUS PHACOEMULSIFICATION AND INTRAOCULAR LENS INSERTION

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Purpose: To compare the postoperative intraocular pressure changes after pars plana vitrectomy combined with or without simultaneous phacoemulsification and intraocular acrylic foldable lens insertion.
Design: Retrospective study.
Participants: We performed a retrospective study of patients who underwent uneventful 20 gauge pars plana vitrectomy combined with or without simultaneous phacoemulsification and intraocular lens implantation from October 2003 to October 2005. Patients with underlying disease, previous history of ocular injury, or who had intraoperative procedures prone to elevate intraocular pressure (IOP) were excluded.
Methods: IOP and the number of glaucoma medication were reviewed in the preoperative and postoperative 1, 2, 3 days, 1, 3 weeks, and 1, 3 months period.
Main outcome measures: Intraocular pressure changes after pars plana vitrectomy with (group a) or without (group b) simultaneous phacoemulsification and intraocular acrylic foldable lens insertion was evaluated.
Results: There were 85 eyes of 85 patients in the vitrectomy only group (a), and 27 eyes of 27 patients in the combined phacovitrectomy group (b). The two most common diagnosis were diabetic retinopathy (60.7%) and branched retinal vein occlusion (19.6%) associated with tractional retinal detachment or vitreous hemorrhage. The mean age at the time of operation was 53.7±11.4 years (a) and 66.5±7.3 years (b) which were significantly different between both groups. Preoperative mean IOP (13.9±2.9 mmHg (a), 12.5±2.1 mmHg(b)) were significantly different between both groups. The mean IOPs on postoperative date (POD) 1, 2, 3 days were significantly higher than the preoperative value in both groups. The mean IOPs on POD 1, 2, 3 months were significantly lower than the preoperative value in both groups. The absolute amount of mean IOP rise (mmHg) (p=0.03, p=0.04) and the percentage of increase (%) (p=0.02, p=0.04), in comparison to the preoperative value, was significantly higher in the combined group (b) than the vitrectomy only group (a) on pod day 1 and day 2. The number of antiglaucoma medication were not significantly different between the two groups at all periods.
Conclusion: Vitrectomy combined with phacoemculsification surgery may have more risk of developing transient IOP increase in the early postoperative period in comparison to vitrectomy performed without phacoemulsification.
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14. COSTING STUDIES: PHARMACOECONOMICS

PP459A THE COSTS AND CONSEQUENCES OF PROGRESSION TO GLACUOMA RELATED VISUAL IMPAIRMENT

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Purpose: We measured increased non-vision care cost associated with progression to visual loss due to glaucoma using Medicare data.
Methods: We analyzed a random 5% sample of Medicare beneficiaries (1999-2003). Presence the ICD-9 code, 365.xx, in a 1999 claim was considered evidence of glaucoma. Inclusion required survival from 1999-2003. Moderate visual loss was defined as severe impairment in the worst seeing eye (ICD-9 ≥ 369.60). Severe visual loss was defined as severe impairment in best seeing eye (ICD-9 369.10 to 369.41). Blindness was defined as near total to profound impairment in both eyes (ICD-9 369.0 to 369.09). We identified those who reported depression, injury and living in long-term care settings. We report the mean total medical costs for each group and the increased risk of depression or injury, and living in an institutional setting associated with progression.
Results: 57,664 beneficiaries were reported as having glaucoma. 54,596 did not experience severe impairment in either eye, while 3,068 beneficiaries (5.3%) reported severe impair-

ment in at least one eye during the five year period. Increased visual impairment was associated with higher overall medical costs in 2003. Those who were blind had the highest cost of those who did not progress ($11,568). Those who progressed from glaucoma to blindness had the highest overall cost ($16,109) . Among those who progressed to vision loss, progression to blindness had the highest incremental cost ($5,510). Those who progressed to any vision loss were more likely to be diagnosed with depression or injury, or to be in long-term care or skilled nursing facility than those who did not, including those who had visual impairment at the beginning of the period.

Conclusions: Among people with glaucoma, progression to loss of visual function in even a single eye is leads to much higher medical costs during the period in which progression occurs. A substantial portion of this cost is associated with avoidable conditions and institutionalization.

PP459B PREFERENCE-BASED MEASUREMENT OF VISION-RELATED QUALITY OF LIFE: ARE WE MIXING APPLES AND ORANGES?

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Purpose: Cost utility studies are growing in use by policy authorities. Frequently, a standard of cost-effectiveness of $50,000-100,000/QALY is used to evaluate the cost-effectiveness of the intervention. This is based upon utility measured from patients or the public using the standard gamble or time trade-off on a scale with death as the lower anchor and perfect health as the upper anchor (*i.e.*, 'policy scale' or PS). In evaluation of vision-related interventions, the utility measures have traditionally been based upon a scale anchored by death and perfect vision (*i.e,* the 'vision truncated scale' or VTS). This approach assumes the two scales are additive, with the vision truncated scale as a subset of the policy scale. However, this assumption has not been tested empirically. In this investigation we seek to determine if there is evidence that the two scales are measuring the same construct and thus might be considered additive.

Methods: We interviewed 443 participants: diabetic retinopathy (DR) = 59, glaucoma = 99, macular degeneration (AMD) = 44, cataract = 132, correctable refractive error (RE) = 109. Utilities were estimated using the standard gamble for two scenarios: 1) assuming current health status including current visual function, what risk of death would be accepted to gain perfect health (PH scenario); 2) assuming current health status and assuming perfect visual function what risk of death would be accepted to gain perfect health (CP scenario). We also administered the SF-36 and NEI-VFQ (a validated instrument to measure vision-related quality of life in 12 domains). We tested two hypothesis to determine if there

Cost of Glaucoma Progression to Visual Impairment Among Medicare Beneficiaries

Group		Beneficiaries	Mean Annual Cost	Incremental Cost (1999-2003)	Percent Increase (1999-2003)	Increased Cost versus Glaucoma Only (2003)	Magnitude Increase Versus No Progression
Glaucoma to Glaucoma	**1999**	53,723	$5,620				
	2003	53,723	$9,500	$3,880	69.0%	N/A	N/A
Glaucoma to Unilateral Visual Impairment	**1999**	1,525	$6,663				
	2003	1,525	$12,832	$6,170	92.6%	$3,332	$2,290
Glaucoma to Bi-lateral Visual Impairment	**1999**	853	$8,147				
	2003	853	$14,353	$6,206	76.2%	$4,853	$2,326
Glaucoma to Profound Blindness	**1999**	690	$6,719				
	2003	690	$16,109	$9,390	139.8%	$6,609	$5,510
Unilateral Impairment to Unilateral Impairment	**1999**	438	$10,050				
	2003	438	$11,489	$1,439	14.3%	$1,989	($2,441)
Bilateral Impairment to Bilateral Impairment	**1999**	207	$13,123				
	2003	207	$10,700	($2,423)	(18.5%)	$1,200	($6,303)
Blindness to Blindness	**1999**	228	$12,145				
	2003	228	$11,568	($579)	(4.8%)	$2,066	($4,459)

was evidence of additivity of the two scales: 1) that the two trades (PH and CP) would differ by an amount that roughly approximated the vision-related utility related to the person's condition; and 2) that the SF-36 and VFQ would show strong correlations on similar domains, and weak correlations on dissimilar ones.

Results: Overall, there was no difference seen between the PH and CP scenarios (see Table). Among specific eye conditions there were extremely modest differences between the scales for those with DR and RE. There was no difference for glaucoma and cataract and the difference seen in AMD may indicate cognitive difficulties in the trade. Similar relationships were seen when disease was stratified by severity (not shown) In comparing the SF-36 and VFQ (not shown) most correlations between domains were weak. Modest correlations (> 0.5) were seen only between the VFQ General Health and the SF-36 General Health, Physical Function, and Vitality domains. The remaining correlations were all less than 0.35 and the majority were less than 0.22.

Conclusions: This investigation provides no evidence that the VTS and PS have an additive relationship. Indeed, it appears that the two trades might be measuring different constructs. Thus where cost-utility analyses is used in evaluation of vision-related interventions, it may be inappropriate to use standards of cost-effectiveness developed on the policy scale.

Condition	N	PH Scenario (SD)	CP Scenario (SD)
All Participants	441	0.90 (0.18)	0.90 (0.19)
Diabetic Retinopathy	58	0.87 (0.20)	0.89 (0.18)
Glaucoma	99	0.89 (0.23)	0.89 (0.24)
Macular Degeneration	44	0.83 (0.27)	Cataract
	131	0.93 (0.13)	0.93 (0.14)
Refractive Error	109	0.91 (0.14)	0.93 (0.12)

PP459 LATE STAGE GLAUCOMA IN EUROPE: COST AND QUALITY OF LIFE OF PATIENTS FROM FOUR COUNTRIES

J. Thygesen *et al.*
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Objective: European studies have identified primary open angle glaucoma (POAG) as the second leading cause of blindness, accounting for 8-10% of blindness in older people. The objective of this study was to estimate the societal costs and the quality of life among patients with late stage POAG. A literature review has shown that patients' quality of life (QoL) is related to glaucoma progression measured by visual acuity (VA). The annual treatment costs were estimated to €885 and community service costs were estimated to €6,097 per year.

Participants: The patients included were all heavily visually impaired with late stage glaucoma (mean Snellen score is 0.3 on best eye) from vision rehabilitation centres.

Methods: Charts of late stage POAG patients in France, Germany, the UK and Denmark were reviewed and the patients were interviewed. Costs and utility values of health related quality of life were estimated (based on resource use multiplied with unit costs and on EQ-5D questionnaire). Health-related QoL was measured by quality-of-life adjusted life years (QALYs), a multiattribute utility scale that is measured on a scale in which 0 = death and 1 = perfect health.

Results: One hundred sixty-two patients were included. Average level of visual acuity was 0.28 and 0.11 of the best and worst eye, respectively. Annual health maintenance costs of late stage glaucoma patients are €830 (SD: €445). This does not include costs of surgery and larger procedures. Purchase costs of devices amount to €2,045 per patient. Most importantly, however, are costs of home care, which average €2,703 per year. With respect to the health related quality of life the average score is 0.67 and best predictor of QoL is visual acuity of the patients' best eye (negatively correlated, p=0.005). Best eye visual acuity is also negatively correlated with health care maintenance costs (p=0.024). With respect to home care costs the correlation is positive, though, but not significant.

Conclusions: This study shows that late stage glaucoma is associated with considerable health care and ' in particular ' social care costs (home care). It is an important finding that maintenance health care costs is negatively correlated with visual acuity (and thereby QoL). A lower visual acuity is predictive of lower QoL.

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15. MISCELLANEOUS

PP472 NEW GLAUCOMA CLASSIFICATION METHOD BASED ON GDX VCC MEASURED PARAMETERS BY CLASSIFICATION TREES

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Purpose: We propose and generate decision tree rules that can handle non-normal data and a large number of possible predictors using the full set of standard GDx VCC measurements for classifying glaucoma in Taiwan Chinese population.

Design: Cross -sectional study.

Participants and/or controls: 40 glaucoma patients and 40 normal subjects were included for training and testing the decision tree rules.

Methods:: Each subject received GDx VCC exam and standard automated perimetry.

Main outcome measures: Decision trees were trained and tested using standard GDx VCC parameters from examinations of 40 subjects with glaucoma and 40 normal subjects.

Results: With 90% accuracy on discriminating glaucoma from normal eyes, 4 promising diagnostic rules were generated from decision tree methods.
Conclusions: New classification trees based on GDX VCC data promise to be a diagnostic tool in glaucoma disease.
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PP473 A SIX-YEARS REVIEW OF DIFFERENT TYPES OF GLAUCOMA IN FUSHUN OPHTHALMOPATHY HOSPITAL

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[3]Beijing Tongren Eye Center, BEIJING, China

Purpose: To investigate the ratio of different type glaucoma, the management of primary angle closure and the visual impairment in Fushun Ophthalmopathy Hospital, a local ophthalmic hospital in northwest China.
Design: Retrospective cases review.
Participants: All the documental files of glaucoma patients admitted in fushun ophthalmopathy hospital were reviewed from January 1, 2000 to December 31, 2005.
Method: All cases were analyzed and re-diagnosed according to both conventional glaucoma definition and Paul J Foster's scheme. Blindness was defined according to who recommended criteria.
Main outcome measures: Vision acurity, rate of blindness.
Results: 1428 cases were recruited. The ratio of PAC/PACG, primary open angle glaucoma (POAG), secondary glaucoma and congenital glaucoma accounted for 79.18% (1145/1428), 2.67% (38/1428), 17.02% (243/1428) and 0.14% (2/1428), respectively. The ratio of primary glaucoma was 82.84% (1183/1428). 80.35% (920/1145) and 19.65% (225/1145) in PACG was responsible for acute angle closure glaucoma and chronic angle closure glaucoma, respectively. Gender distributing: the male were 515 cases, female were 913 cases, in acute angle closure glaucoma, the overwhelming cases were female (constituting 75.43%, 694 cases out of 920 cases). Binocular blindness rate of primary glaucoma was 4.56% (54/1183). The rate of blindness in at least one eye of primary glaucoma was 18.60% (220/1183). Trabeculectomy was performed in 96.42% (1104/1145) of pacg eyes. The incidence of complication in glaucoma filtering surgery was 25.54% (282/1104).
Conclusions: Primary angle closure glaucoma is the major type of glaucoma in hospitalized patients. The prevalence of acute angle closure is more than that of chronic angle closure in fushun area. The blindness rate is much higher than previous report in south china. It may indicate that the feature of pacg is different between south and north China.
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Specialists suffer from two problems: first, their patients think they know everything; and second, so does the specialist.

LUMIGAN® (bimatoprost ophthalmic solution) 0.03% is indicated for reducing intraocular pressure (IOP) in patients with open-angle glaucoma or ocular hypertension who are intolerant or insufficiently responsive to other intraocular pressure lowering medications. LUMIGAN is convenient for physicians and patients. It is dosed once-daily and does not require refrigeration. LUMIGAN is available in 2.5-mL, 5-mL, and 7.5-mL sizes.

ALPHAGAN® P (brimonidine tartrate ophthalmic solution) 0.15%, a reformulation of original ALPHAGAN® (brimonidine tartrate ophthalmic solution) 0.2%, is indicated for the reduction of elevated intraocular pressure (IOP) in patients with open-angle glaucoma or ocular hypertension. It offers comparable efficacy to original ALPHAGAN®. ALPHAGAN® P is available in 5-mL, 10-mL, and 15-mL sizes.

COMBIGAN™ (brimonidine tartrate/timolol ophthalmic solution) is a fixed-combination eye drop solution indicated for the reduction of elevated intraocular pressure (IOP) in patients with chronic open-angle glaucoma or ocular hypertension who are insufficiently responsive to topical beta-blockers. COMBIGAN™ provides a dual mechanism of action that produces powerful intraocular pressure reduction. The key ingredient in COMBIGAN™ is shown to have greater efficacy than COSOPT®. Allergies developed while using ALPHAGAN® P Ophthalmic Solution do not occur, or occur less frequently in patients using COMBIGAN™ Ophthalmic Solution.

GANFORT® (bimatoprost/timolol ophthalmic solution) is a fixed-combination eye drop solution indicated for the reduction of elevated intraocular pressure (IOP) in patients with open-angle glaucoma or ocular hypertension who are insufficiently responsive to topical beta-blockers, prostaglandin analogues or prostamides. It is administered as a single daily drop in the morning. The active ingredients of GANFORT® lower IOP by complementary mechanisms; bimatoprost increases aqueous outflow through both the trabecular meshwork and uveoscleral outflow pathways, while timolol reduces aqueous production. The combination of bimatoprost and timolol in a fixed combination provides a valuable treatment option by offering these two first-line agents in a single multi-dose bottle, thereby helping to enhance compliance.

FACT SHEET

PRODUCT DESCRIPTION

XALATAN® (latanoprost ophthalmic solution) is related to a class of compounds called prostaglandins, which act locally in the eye to increase drainage of aqueous humor and reduce intraocular pressure (IOP).

XALATAN® provides effective IOP reduction throughout the day and at night with convenient once-a-day dosing.

INDICATIONS

XALATAN® is indicated for the reduction of elevated intraocular pressure in patients with open-angle glaucoma or ocular hypertension.

IMPORTANT SAFETY CONSIDERATIONS/ SAFETY PROFILE:

Xalatan® has been shown to cause changes to pigmented tissues. Most frequently reported are increased pigmentation of the iris, eyelid and eyelashes, and growth of eyelashes. Pigmentation is expected to increase as long as Xalatan® is administered. Iris pigmentation is likely to be permanent while eyelid skin darkening and eyelash changes may be reversible. The effects beyond 5 years are unknown.

Xalatan® should be used with caution in patients with a history of intraocular inflammation (iritis/uveitis) and should generally not be used in patients with active intraocular inflammation. Xalatan® should be used with caution in aphakic patients, in pseudophakic patients with a torn posterior lens capsule, or in patients with known risk factors for macular edema.

Most common ocular events/signs and symptoms (5% to 15%) reported with Xalatan® in the three 6-month registration trials included blurred vision, burning and stinging, conjunctival hyperemia, foreign-body sensation, itching, increased iris pigmentation, and punctate epithelial keratopathy.

There have been reports of bacterial keratitis with the use of multiple-dose containers of topical ophthalmic products.

DOSAGE

The recommended dosage of **XALATAN®** (0.005%) is one drop in the affected eye once daily at night.

MECHANISM OF ACTION

XALATAN® is a prostaglandin analog. It is believed to relieve pressure in the eye by opening up channels that allow the fluid inside the eye to drain.

MARKETING

XALATAN® is marketed by Pfizer Inc. (NYSE: PFE). It was approved for marketing by the U.S. Food and Drug Administration (FDA) in June 1996.

CONTACT

To speak with a physician or Pfizer Ophthalmics representative, contact Geoff Curtis at gcurtis@weisscommpartners.com or 312-550-8138.

Once Daily
Xalacom™
latanoprost/timolol maleate

FACT SHEET

PRODUCT DESCRIPTION

XALACOM™ (latanoprost/timolol maleate) is a fixed combination of two classes of compounds which lower the pressure in the eye in different ways. Prostaglandins act locally in the eye to increase drainage of aqueous humour and beta-blockers reduce the inflow of fluid inside the eye.

XALACOM™ provides effective intraocular pressure (IOP) reduction throughout the day and at night with convenient once-a-day dosing.

INDICATIONS

XALACOM™ is indicated for the reduction of elevated IOP in patients with open-angle glaucoma or ocular hypertension.

IMPORTANT SAFETY CONSIDERATIONS/ SAFETY PROFILE:

Xalacom™ should be used with caution in patients with a history of severe cardiac disease. Due to its beta-blocker component, the same types of cardiovascular and pulmonary adverse reactions as seen with systemic beta-blockers may occur.

Caution should also be taken when administering Xalacom™ to patients subject to spontaneous hypoglycaemia or diabetic patients as beta-blockers may mask the signs and symptoms of acute hypoglycaemia.

While taking beta-blockers, patients with a history of atopy or of severe anaphylactic reaction to a variety of allergens may be unresponsive to the usual doses of adrenaline used to treat anaphylactic reactions.

Xalacom™ has been shown to cause changes to pigmented tissues. Most frequently reported are increased pigmentation of the iris, eyelid and eyelashes, and growth of eyelashes. Pigmentation is expected to increase as long as Xalacom™ is administered. Iris pigmentation is likely to be permanent while eyelid skin darkening and eyelash changes may be reversible.

Xalacom™ should be used with caution in patients with a history of intraocular inflammation (iritis/uveitis) and should generally not be used in patients with active intraocular inflammation. Xalacom™ should be used with caution in aphakic patients, in pseudophakic patients with a torn posterior lens capsule, or in patients with known risk factors for macular edema.

Most common ocular events/signs and symptoms (1% to 12%) reported with Xalacom™ in the three 6-month registration trials included stinging, burning and itching, eye hyperaemia, corneal disorders, conjunctivitis, blepharitis, eye pain, headache and skin rash.

There have been reports of bacterial keratitis with the use of multiple-dose containers of topical ophthalmic products.

Xalacom™ is contraindicated for patients with reactive airway disease including bronchial asthma of severe chronic obstructive pulmonary disease, and patients with sinus bradycardia, second or third degree atrioventricular block, overt cardiac failure or cardiogenic shock.

DOSAGE	The recommended dosage of **XALACOM**™ is one drop in the affected eye once daily.
MECHANISM OF ACTION	**XALACOM**™ is a combination of a prostaglandin analog and a beta-blocker. It is believed that the prostaglandin analog opens ups channels that allow the fluid inside the eye to drain and the beta-blocker reduces the inflow of fluid inside the eye, thus relieving IOP.
MARKETING	**XALACOM**™ is marketed by Pfizer Inc. (NYSE: PFE). Xalacom™ has been approved for use in Europe since December 2000 and is available in most other countries outside of the US and Japan. In the United States, the Food and Drug Administration (FDA) has granted it approvable status.
CONTACT	To speak with a physician or Pfizer Ophthalmics representative, contact Con Franklin at **con.franklin@resolutecommunications.com** or +44 207 015 1354

ABOUT PFIZER OPHTHALMICS

Pfizer Ophthalmics, a division of Pfizer Inc., is committed to preserving sight and eliminating preventable blindness. Pfizer Ophthalmics discovers, develops and provides leading treatments in ophthalmology to support patients who are at risk of blindness or suffering from vision impairment, and to serve the health care professionals who treat them. Its current product line includes the most prescribed treatment to lower elevated eye pressure in patients with ocular hypertension (abnormally high eye pressure) or open-angle glaucoma. Outside of the United States, the division globally promotes a treatment for neovascular age-related macular degeneration. Pfizer ranks second in world-wide Ophthalmic sales, and is a leader in humanitarian efforts to eradicate blindness through programs such as the International Trachoma Initiative.

If you live to the age of a hundred, you have got it made, because very few people die past the age of hundred.

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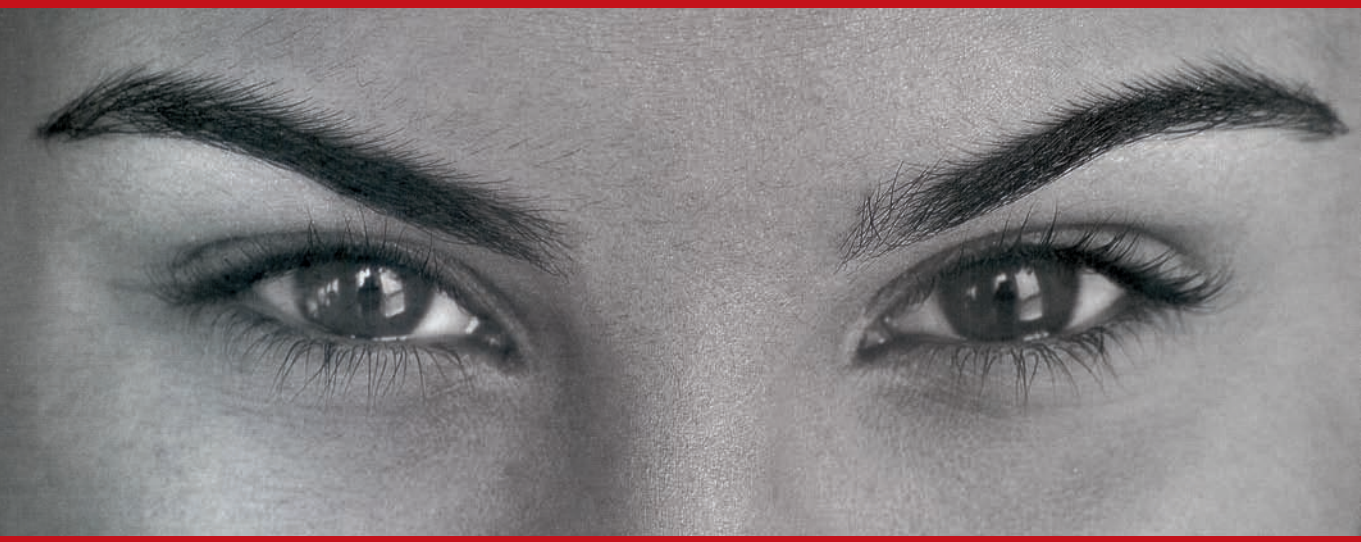

as of July 22, 2007 the name of the

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