WORLD GLAUCOMA CONGRESS

Disclaimer

The Association of International Glaucoma Societies (AIGS) organizes the World Glaucoma Congress with the aim of providing education and scientific discourse in the field of glaucoma. The AIGS accepts no responsibility for any products, presentations, opinions, statements or positions expressed by speakers at the congress. Inclusion of material in the scientific program does not constitute an endorsement by AIGS.

Useful telephone numbers

	Telephone	Fax
Registration desk / participant support	(+ 43 1) 931020 - 7101	(+43 1) 931020 - 7110
Message desk	(+ 43 1) 931020 - 7102	
Social Desk (hotels, excursions, city information)	(+ 43 1) 931020 - 7103	(+43 1) 931020 - 7111
Audio Visual Support - Speaker Ready Room	(+ 43 1) 931020 - 7501	

ISBN 90 6299 205 6

Produced by Kugler Publications, P.O. Box 97747, 2509 GC The Hague, The Netherlands, on behalf of Geneva Medical Publishers, Geneva, Switzerland.

Cover design: Cees van Rutten, The Hague, The Netherlands
Typesetting: Palm Produkties, Nieuwerkerk a/d IJssel, The Netherlands
Printed by Koninklijke Drukkerij C.C. Callenbach bv, Nijkerk, The Netherlands

CME Credits

The World Glaucoma Congress participants may apply for CME credits which are supplied by the following institutions:

1. European Accreditation Council for Continuing Medical Education (EACCME): 21 European credit hours.
2. The New York Eye and Ear Infirmary (NYEEI): this continuing medical education activity has been designated for a maximum of 23 hours of Category I Credit toward the AMA Physician's Recognition Award.
3. The Österreichische Akademie der Ärzte: 33 Austrian credit points.

The following statements are required for receiving credits through joint sponsoring with the NYEEI:

Course Description & Needs Assessment

Glaucoma patients comprise at least 20% of the patients seen in general ophthalmic practice. With new research findings and the constantly evolving advances in diagnostic and treatment techniques it is imperative that the general ophthalmologist constantly update his/her knowledge in the diagnosis and treatment of glaucoma. In didactic lectures and courses the World Glaucoma Congress, with its faculty of over 130 international glaucoma experts, will address the latest developments in the field of glaucoma.

Learning Objectives

Upon completion of this educational activity, attendees should have a better understanding of the latest developments in glaucoma diagnosis and therapy and be able to apply this knowledge to the treatment of their glaucoma patients, thus providing a higher level of patient care.

Target Audience

General ophthalmologists and glaucoma specialists.

Accreditation Statement and Credit Designation

This continuing medical education activity is jointly sponsored by The New York Eye and Ear Infirmary and the Association of International Glaucoma Societies and has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME). The New York Eye and Ear Infirmary is accredited by the ACCME to provide continuing medical education for physicians. This educational activity has been designated for a maximum of 23 hours of Category I Credit toward the AMA Physician's Recognition Award. Each participant should only claim credit for the number of hours he/she actually spent in the educational activity.

Disclosure Policy Statement

The New York Eye and Ear Infirmary Institute for Continuing Medical Education requires that each participant/teacher in a CME accredited educational activity disclose the existence of any financial interest and/or other relationship(s) (*e.g.* paid speaker, employee, paid consultant on a Board and/or Committee for a commercial company) that would potentially affect the objectivity of his/her presentation. Speakers are also asked to make a disclosure that a product is still investigational when an unlabeled use of a commercial product or an investigational use not yet approved for any purpose is discussed during an educational activity. The disclosed information in no way presumes to assess the participant's qualifications or suitability. The intention is to provide full disclosure of any potential conflict-of-interest, real or perceived, which is related to a specific event. Full disclosure of faculty and commercial relationships, if any, will be made at the program.

Provider Disclosure

The New York Eye and Ear Infirmary Institute for Continuing Medical Education received a financial benefit from the Association of International Glaucoma Societies for accrediting this educational activity. However, The New York Eye and Ear Infirmary has no vested interest in any of the companies sponsoring this educational activity.
You are referred to the CME attendance booklet for further information.

"She walks in beauty, like the night
Of cloudless climes and starry skies". . .

Lord Byron

A thing of beauty is a joy for ever:
Its loveliness increases; it will never
Pass into nothingness; but still will keep
A bower quiet for us, and a sleep
Full of sweet dreams, and health, and quiet
Breathing

John Keats

"The beauty is first of all eternal; it neither comes into being nor passes away; neither waxes nor wanes; next it is not beautiful in part and ugly in part, nor beautiful at one time and ugly at another, nor beautiful in this relation and ugly in that, nor beautiful here and ugly there, as varying according to its beholders; nor again will this beauty appear to the imagination like the beauty of a face or hands or anything else corporeal, or like the beauty of a thought or science, or like beauty which has it seat in something other than itself, be it in a living thing or the earth or the sky or anything else whatsoever; he will see it as absolute, existing alone within itself, unique, eternal."

Diotima – teacher of Socrates

This continuing medical education activity is jointly sponsored by the New York Eye and Ear Infirmary and the Association of International Glaucoma Societies.
This continuing medical education activity is supported through unrestricted educational grants from Alcon, Allergan, Carl Zeiss Meditec, Heidelberg Engineering, Pfizer Ophthalmics, Ziemer Ophthalmic Systems.

IMPERIAL SPONSORS

Alcon®

Pfizer Ophthalmics

MAJOR SPONSORS

ALLERGAN

MSD

SPONSORS

ZEISS CARL ZEISS MEDITEC

Santen
Seeing Beyond the Ordinary

HEIDELBERG ENGINEERING

Ziemer Ophthalmic Systems

EXHIBITORS

1. Allergan Inc
2. Pfizer Inc
3. Merck Sharpe & Dohme
4. Alcon Laboratories Inc
5. Santen OY
6. Ziemer Ophthalmic Systems AG
7. Heidelberg Engineering
8. Carl Zeiss Meditec AG
9. Oculus Optikgerate GmbH
10. Haag-Streit AG
11. International Glaucoma Association
12. Solx, Inc
13. Ocular Surgery News Europe/Asia-Pacific
14. AMO Germany GmbH
15. Medtronic Ophtalmics
16. Talia Technology GmbH
17. Kowa Europe GmbH
18. European Society of Cataract and Refractive Surgery
19. Ophthalmology Times
20. AIGS/IGR
21. Laserex
22. 3W Informed
23. Staar Surgical AG
24. Optonol AG
25. Wisepress Online Bookshop Ltd.
26. Ryazan State Instrument-Making Enterprise


S Parks

CONTENTS

ABSTRACTS

Posters

NON SMOKING POLICY

Please be informed that the World Glaucoma Congress is a non smoking congress: the congress committees thank all participants to refrain from smoking in the congress venue.

MOBILE PHONES

We kindly request to all participants to keep mobile phones turned off in the conference area and especially in the meeting rooms during the scientific sessions.

WELCOME

Welcome by the President

It is a privilege to welcome you to Vienna and the inaugural World Glaucoma Congress, held under the auspices of the Association of International Glaucoma Societies. This meeting has been made possible by the active involvement and participation of our 63 independent Glaucoma Society members, representing six continents, and our Glaucoma Industry members.

For this event, a major effort has been made to provide for both the generalist and the glaucoma specialist an educational and scientific program that is comprehensive, timely, and highly relevant, as well as one that delivers impeccable didactic and scientific quality. Comprised of more than 140 renowned authorities on glaucoma, the Congress faculty for this unprecedented meeting is extraordinary. Their commitment and contributions to enhance glaucoma education and care, as well as their collegiality and dedication to excellence, will be apparent throughout the program.

Vienna has been throughout history, and continues to be, an important international destination for landmark gatherings, as we expect this Congress will be. It also is a glorious city with unparalleled cultural activities and entertainment. Therefore, you also should expect a very enjoyable time.

On behalf of the Board of Governors and each of our member organizations, I extend to all who have joined us at this memorable event our best wishes for a successful and stimulating meeting.

Professor Robert N. Weinreb
President
Association of International Glaucoma Societies

My speech was this morning . . . . The hall was crowded to the doors.
No, Anya, no, you can never imagine the sensation it produced.

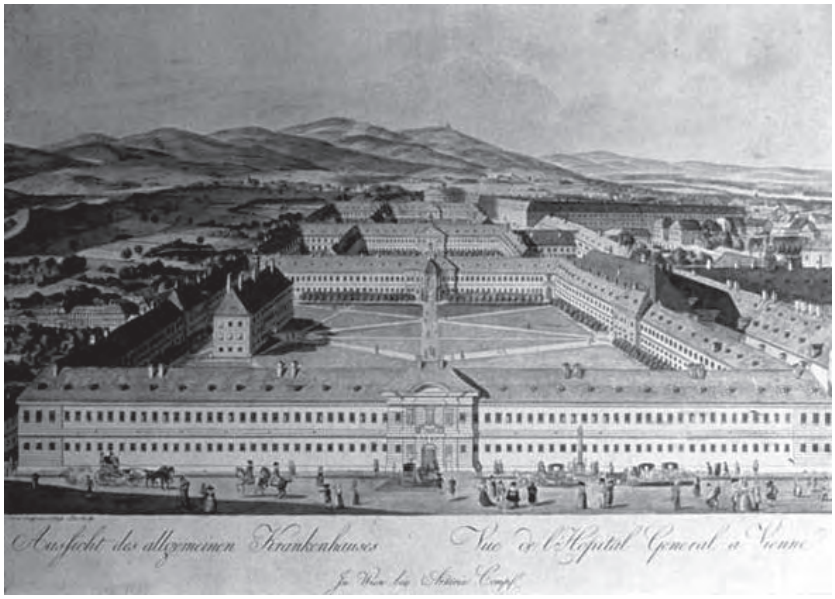
F.M. Dostoyevsky

Welcome by the Glaucoma Board of the Austrian Ophthalmological Society and Local Organizing Committee

Dear Colleagues,

Vienna, over centuries a melting pot of various different European cultures, remains a city of dreams, for both body and soul. It is famous for some of the world's greatest pastries, wonderful coffee houses and wine-makers, a grand opera, theaters and numerous museums; it is the home of Beethoven, Strauss, Schubert and Haydn and besides that, it shows a very important connection to ophthalmology. Vienna is the home of the world's first ophthalmological clinic. Most of the credit for this development goes to Georg Joseph Beer (1763-1821). In 1805 he performed the first iridectomy for pupilloplasty, not for glaucoma. Based on discussions with his friend Sigmund Freud, who used cocaine in the treatment of the central nervous system, Karl Koller (1858-1944) introduced the use of cocaine as a topical anaesthetic for ophthalmic surgery in 1884.
Another essential knowledge is based on the first description of glaucomatous optic nerve atrophy in 1892 by Isidor Schnabel.
Probably the most lasting influence was given by Ernst Fuchs (1851-1926).
Working on different fields of ophthalmology he also paid attention to glaucoma. "The consequence of elevated intraocular pressure is a disturbance in blood circulation in the eye […] Elevated intraocular pressure causes compression of the venous system […]" He also described the 'whip out' phenomenon of the visual field after glaucoma surgery; he recommended early surgery in advanced cases.
Whereas essential understanding in glaucoma can be found in the past, this meeting will work on a worldwide accepted definition, classification, diagnosis and treatment modalities of this chronic disease. The possibility for interactive discussions should help in creating new milestones in glaucoma…
In the name of the 'Glaucoma Board of the Austrian Ophthalmological Society' we welcome you to our wonderful city and wish you some informative, pleasant days.

Andrea Mistlberger and Tony Hommer



THEME ONE

Ode to Joy

Joy, o wondrous spark divine,
Daughter of Elysium,
Drunk with fire now we enter,
Heavenly one, your holy shrine.
Your magic powers join again
What fashion strictly did divide;
Brotherhood unites all men
Where your gentle wings spread wide.

Embrace each other now, you millions!
The kiss is for the whole wide world!

Brothers - over the starry firmament
A beloved Father must surely dwell.

Freude, schöner Götterfunken,
Tochter aus Elysium,
Wir betreten feuertrunken,
Himmlische, dein Heiligtum.
Deine Zauber binden wieder,
Was die Mode streng geteilt,
Alle Menschen werden Brüder,
Wo dein sanfter Flügel weilt.

Seid umschlungen, Millionen!
Diesen Kuß der ganzen Welt!

Brüder - überm Sternenzelt
Muß ein lieber Vater wohnen.

Text: Friedrich Schiller (1759-1805)
Music: Ludwig Von Beethoven (1770-1827)

THEME TWO

Glaucoma Hymn

Glaucoma, Glaucoma, Glaucoma
Constricting vision slowly
Halted by progress of science
Vision of a world united
Beyond all science knowing

"To know that what is impenetrable to us really exists, manifesting itself to us as the highest wisdom and the most radiant beauty, which our dull faculties can comprehend only in their most primitive forms – this knowledge, this feeling, is at the center of all true religiousness. In this sense, and in this sense only, I belong to the ranks of devoutly religious men."

Albert Einstein

For I remained not knowing,
Beyond all science knowing.

St John of the Cross

TABBLAD ADVERTENTIE PFIZER

PROGRAM AT A GLANCE

WEDNESDAY July 6	THURSDAY July 7	FRIDAY July 8	SATURDAY July 9
	7.30-8.15 "Meet the Expert" R Pfizer Morning Symposium St 2 Heidelberg Morning Symposium S1	7.30-8.15 "Meet the Expert" R Ziemer Morning Symp S4 Zeiss Morning Symp S2 Pfizer Morning Symp St 1	
	8.30-10.00 Session 3 Diagnosis Based on Structure Diagnosis Based on Function Update Structure and Function P	8.30-10.00 Session 6 Angle Closure Glaucoma CCT Risk Factors Screening P	9.00-10.00 Session 10 Medical Treatment P 9.00-10.00 Session 11 Alternative Treatment Laser Treatment L
9.30-10.15 Alcon Morning Symposium St 1	10.00-10.30 Break	10.00-10.30 Break	10.00-10.30 Break
10.30-12.00 Inaugural Assembly Meeting of National and Regional Glaucoma Societies P	10.30-12.00 Session 4 Risk and Progression Quality of Life, Genetics, Pseudoexfolitation P	10.30-12.00 Session 7 Value Based Medicine RCT's Environmental Factors IOP Global Guidelines P 10.30-12.00 Session 8 From Science to Clinic L	10.30-12.00 Session 12 Glaucoma Surgery Consensus P 10.30-11.45 Session 13 Glaucoma Surgery Videos L
12.30-1.30 Special Midday Symposium Merck P 12.00-2.00 Lunch break	12.00-12.15 AIGS-Award P 12.15-1.15 Special Midday Symposium Pfizer P 12.15-2.15 Lunch break	12.05-1.05 Special Midday Symposium Alcon P 12.00-2.00 Lunch break	12.15-1.15 Special Midday Symposium Allergan P 12.00-2.00 Lunch break
2.00-2.35 Opening Ceremony P	2.15-3.15 Session 5 Glaucoma Societies Soc. impact of glaucoma Pathogen., progr. ACG P 2.15-3.15 4 Parallel Courses	2.00-3.00 Session 9 Glaucoma Societies Woundhealing Ant. segment after surgery P 2.00-3.00 4 Parallel Courses	2.00-3.00 Session 14 Glaucoma Societies NTG Perimetry after surgery P 2.00-3.00 4 Parallel Courses
2.40-4.10 Session 1 Glaucoma Worldwide New Research P	3.30-4.30 14 Parallel Courses	3.15-4.15 14 Parallel Courses	3.15-4.15 10 Parallel Courses
4.10-4.40 Break			
4.40-5.30 Session 2 New Ideas P	4.45-6.15 Poster Walkthrough + Technical Exhibition	4.30-6.00 Poster Session P	4.30-5.30 Session 15 Closing Symposium Young Clinician Scientists: The Future of Glaucoma P
Reception "Rathaus" 7.00-9.00	Free for a.o. National Gatherings	Imperial Viennese Glaucoma Ball 7.30-1.00	Farewell Party Albertina 7.00-9.00

Legend: L = Room Lehar 3+4; P = Plenary Room = Strauss 1+2+3; R = Restaurant Piazza; S = Room Schubert; St = Room Stolz.

SCIENTIFIC PROGRAM

Truman's Law

If you cannot convince them, confuse them

Gunmidge's Law

The amount of expertise varies in inverse proportion to the number of statements understood by the general public

The number behind the time indication in the day-to-day program (*e.g.* D001 etc.) refers to the abstract numbers in the following categories:

O = Opening Ceremony
D = Didactic Sessions
GS = Glaucoma Societies Sessions
C = Courses

Prelude to the Scientific Program: Nodding-off episodes

Rockwood K, Hogan DB, Patterson CJ, for the Nodding and Presentations (NAP) Investigators, report in their article 'Incidence of and risk factors for nodding off at scientific sessions' (Can Med Assoc J 2005; 171: 1443-1445), on the conduct of a surreptitious, prospective, cohort study to explore how often physicians nod off during scientific meetings and to examine risk factors for nodding off. After counting the number of heads falling forward during two days of lectures, they calculated the incidence density curves for nodding off episodes per lecture (NOEL's) and assessed risk factors using logistic regression analysis. They report their eye-opening results and suggest ways in which speakers can try to avoid losing their audience.

The outcome measure was the number NOEL's per 100 participants. The authors counted 3-24 (median 18) NOEL's per 100. Verily a respectable number. The risk factors are reproduced in the table.

Risk Factors for nodding off at lectures

Factor	Odds ration (and 95% CI*)
Environmental	
Dim lighting	1.6 (0.8-2.5)
Warm room temperature	1.4 (0.9-1.6)
Comfortable seating	1.0 (0.7-1.30
Audiovisual	
Poor slides	1.8 (1.3-2.0)
Failure to speak in the microphone	1.7 (1.3-2.1)
Circadian	
Early morning	1.3 (0.9-1.8)
Post prandial	1.7 (0.9-2.3)
Speaker-related	
Monotonous tone	6.8 (5.4-8.0)
Tweed jacket	2.1 (1.7-3.0)
Losing place in lecture	2.0 (1.5-2.6)

*CI=Confidence Interval

This information has been included in the program for the benefit of both speakers and listeners.

WEDNESDAY JULY 6, 2005

09.30 – 10.15. Room Stolz 1: Alcon Symposium: Treatment trends: fixed combination therapy.
Chair: A.G.P. Konstas

09.30 **Role of fixed combinations in glaucoma therapy**
A.G.P. Konstas

09.35 **Novel fixed combination, a phase 3 overview**
D. Bertin

09.50 **European posology study for a novel fixed combination**
P. Denis

10.05 **Discussion**

10.15 **End**

10.30 – 12.00 pm. Plenary Room. Inaugural Assembly Meeting of all National and Regional Glaucoma Societies.
Co-chairs: R.N. Weinreb, Rick Wilson, E.L. Greve

10.30 **Opening**
R.N. Weinreb

History and accomplishments
E.L. Greve

Goals of the AIGS
R.A. Hitchings

Glaucoma Society Organization, Directory
Rick Wilson

Introduction of Glaucoma Societies
Rick Wilson, Erik Greve

AIGS Guidelines for meetings
K. Singh, C. Migdal

Global Glaucoma Patient Organization
R. Ritch, I. Goldberg and representatives of Global Glaucoma Patient Organization, International Glaucoma Association and Ghana Glaucoma Association

Discussion and Interactive Questions

AIGS Program

12.00 **End**

12.00 – 2.00 pm. LUNCH BREAK and SPECIAL MIDDAY SYMPOSIUM

12.30 – 1.30 pm. Plenary Room: Merck Special Midday Symposium: Therapeutic implications of IOP and OBF: one powerful solution.
Chair: L. Schmetterer

12.30 **Welcome and introduction**
L. Schmetterer

IOP in glaucoma: The value of 24 hr control
A.G.P. Konstas

Compromised bloodflow and glaucomatous damage: Evidence Based Medicine
J. Flammer

Pressure and perfusion: Clinical practicalities in optimal patient care
M.R. Lesk

Panel Discussion
L. Schmetterer

1.30 **End**

2.00 – 2.35 pm. Plenary Room. Opening Ceremony.
Co-chairs: R.N. Weinreb, R.A. Hitchings, Y. Kitazawa

2.00		**Opening 'Alle Menschen werden Brüder'***
2.03	O1	**The World Glaucoma Congress** R.N. Weinreb
2.06	O2	**International cooperation** O. Von Habsburg
2.21	O3	**Glaucoma cooperation in Asia** Y. Kitazawa
2.24	O4	**Glaucoma cooperation in Latin America** R. Susanna
2.27	O5	**The World Glaucoma Congress** E.L. Greve
2.31		**Music: AIGS hymn**
2.35		**End**

2.40 – 4.10 pm. Plenary Room. Opening Session 1.
Co-chairs: M. Araie, R. Susanna, A. Heijl

Part A: Glaucoma Worldwide

2.40	D1	**Non-governmental agencies and centers of excellence** G.N. Rao
2.50	D2	**The glaucoma blindness prevention program of the WHO** S.P.Mariotti
2.58	D3	**Glaucoma as a worldwide health problem** H.A.Quigley
3.06	D4	**Research priorities in worldwide glaucoma** R. Thomas
3.14	D5	**Public health issues in glaucoma** I. Goldberg
3.22		**Conclusion**

Part B: New Research

3.24	D6	**How does the trabecular meshwork function?** E.R. Tamm

* Brotherhood unites all men

3.32	D7	**Will we be able to see apoptotic RGC's?** M.F. Cordeiro
3.40	D8	**Is glaucoma a systemic disease curable by therapeutic neuroprotective vaccination?** M. Schwartz
3.48	D9	**Glaucoma: more than the eye of the beholder** Y.H.Yücel
3.56	D10	**What damages the optic nerve?** R.N. Weinreb
4.04		**Conclusion**

4.10 – 4.40 pm. BREAK

4.40 – 5.30 pm. Plenary Room. Opening Session 2. New Ideas. Co-chairs: R. Ritch, J. Ge, F. Medeiros

4.40	D11	**Glaucoma examination** P.P. Lee
4.48	D12	**Medical advice from glaucoma informatics study** P.A.Sample
4.56	D13	**We should measure IOP continuously** P. Walter
5.04	D14	**Is gene therapy coming?** P.L. Kaufman
5.12	D15	**Relative merits of various treatment modalities** R.A. Hitchings
5.20	D16	**Will trabeculectomy survive?** R.A. Lewis
5.28		**Conclusion**

Clark's Law of Revolutionary Ideas

Every revolutionary idea – in Science, Politics, Art or Whatever –
evokes three stages of reaction. They may be summed up by the three phrases:
1. "It is impossible – don't waste my time"
2. "It is possible, but it is not worth doing"
3. "I said it was a good idea al along"

THURSDAY JULY 7, 2005

07.30 – 08.15. 'MEET THE EXPERT' BREAKFAST TABLES (see also page 45)

07.30 – 08.15. Room: Schubert 1: Heidelberg Engineering Symposium.

07.30 **HRT baseline topographic optic disc measurements are associated with the development of POAG: results of the OHTS ancillary study**
L.M. Zangwill

Progression analysis with the HRT and its relation to functional change
D.F. Garway-Heath

08.15 **End**

07.30 – 08.15. Room: Stolz 2. Pfizer Symposium: Success through persistency: long-term management of glaucoma

07.30 **Persisitency *vs* discontinuation: identifying who and why**
H.A. Quigley

07.50 **Practical considerations for maintaining therapy: role of the ophthalmologist**
I. Goldberg

08.10 **Panel discussion**

08.15 **End**

08.30 – 10.00. Plenary Room. Session 3.
Co-chairs: L.M. Zangwill, R.A. Perez-Grossman, M.Aihara

Part A: Diagnosis Based on Structure

08.30 D17 **Documenting the optic nerve**
D.S. Greenfield

08.38 D18 **Photography: diagnosis based on structure**
J.B. Jonas

08.43 D19 **Confocal Scanning Laser Topography**
D.F. Garway-Heath

08.48 D20 **Confocal Scanning Laser Polarimetry**
H.G. Lemij

08.53 D21 **Optical Coherence Tomography**
F. Medeiros

08.58 **Panel Discussion, IAQ, Conclusion**

Part B: Diagnosis Based on Function

09.10 D22 **The interpretation of standard automated perimetry**
P.A. Sample

09.18 D23 **Selective tests of visual function**
C.A. Johnson

09.26 D24 **Abnormal visual function is required for diagnosis**
A. Heijl

09.31 D25 **Abnormal visual function is not required for diagnosis**
G.A. Cioffi

09.36 **Panel Discussion, IAQ, Conclusion**

THURSDAY JULY 7, 2005

Part C: Consensus Update S&F

09.50 D26 **Update on the Consensus on Structure and Function**
R.N. Weinreb, E.L. Greve

10.00 **End**

10.00 – 10.30. BREAK

10.30 – 12.00. Plenary Room. Session 4.
Co-chairs: E.L. Greve, C. Baudouin, E.Z. Blumenthal

Part A: Risk and Progression

10.30 **IAQ**
10.34 D27 **Risk assessment in glaucoma management**
D.S. Friedman

10.42 D28 **Function aspects of progression**
B. Chauhan

10.50 D29 **Structure aspects of progression**
C.A. Girkin

10.58 D30 **Function and structure aspects of progression**
L.M. Zangwill

11.06 **Panel Discussion, IAQ, Conclusion**

11.20 **End**

Part B: Quality of Life, Genetics, Pseudoexfoliation

11.20 D31 **Quality of life and glaucoma I**
R.K. Parrish

11.26 D32 **Quality of life and glaucoma II**
M. Araie

11.32 **IAQ, Conclusion**

11.36 D33 **The molecular genetics of glaucoma**
W.L.M. Alward

11.44 **IAQ, Conclusion**

11.49 D34 **Systemic factors in exfolitation syndrome**
R. Ritch

11.57 **IAQ, Conclusion**

12.00 **End**

12.00-12.15 pm. AIGS-AWARD 2004 CEREMONY

12.15 – 2.00 pm. LUNCH BREAK and SPECIAL MIDDAY SYMPOSIUM

12.15 – 1.15 pm. Plenary Room. Pfizer Special Midday Symposium: The constant revolution: turning concepts into practice for better clinical outcomes. Chair: R.N. Weinreb

12.15 **The glaucoma continuum – into clinical practice**
R.N. Weinreb

Viewing evidence in the round: the EGPS results and their clinical application
S. Miglior

The quality of IOP lowering: managing the circadian cycle
K. Singh

The widening circle: turning to adjunctive therapy
N. Pfeiffer

Summary – clinical pearls
R.N. Weinreb

1.15 **End**

2.15 – 3.15 pm. Plenary Room. Session 5. Glaucoma Society Session. Co-chairs: I. Goldberg, D. Grigera

2.15	GS1	**Societal impact of glaucoma** A.L.Coleman (AGS)
2.27		**Panel Discussion, IAQ**
2.45	GS2	**Pathogenesis and progression of primary angle closure glaucoma** R. Sihota (GSI)
2.57		**Panel Discussion, IAQ**
3.15		**End**

2.15 – 3.15 pm. PARALLEL COURSES

C001	**An overview on new instruments and technology for imaging introductory)** L.M. Zangwill (chair), E.Z. Blumenthal, S. Miglior, D.S. Greenfield	Lehar 1
C002	**Advanced optic nerve imaging (HRT, GDX, OCT) – part 1** H.G. Lemij (chair), R.D. Fechtner, F.A. Medeiros, C.F. Burgoyne, M.M. Iester, R. Burk, M. Fingeret	Stolz 1
C003	**Advances in psychophysical testing for glaucoma patients – part 1** P.A. Sample (chair), S.L. Graham, R. Harweth	Stolz 2
C004	**How to detect progression and use it to manage glaucoma – part 1** D.F. Garway-Heath (chair), B.C Chauhan, L.M. Zangwill, A. Heijl	Lehar 2

3.30 – 4.30 pm. PARALLEL COURSES

C005	**The art of written and oral presentations** D.S. Minckler (chair), R. Hitchings	Lehar 1
C006	**Design, conduct and interpretation of clinical trials: pearls and pitfalls** K. Singh (chair), A. Coleman, H.A. Quigley, R.P.L. Wormald	Plenary Room

THURSDAY JULY 7, 2005

C007	**Visual disability, quality of life, and outcomes** A.C. Viswanathan (chair), A. Azuara-Blanco, P.P. Lee, R.K. Parrish, G.L. Spaeth	Lehar 3
C008	**Risk factors for the development and progression of glaucoma** R. D. Fechtner (chair), D.S. Friedman, P. Mitchell, T. Yamamoto	Lehar 4
C009	**Proof of ganglion cell death prevention** L. Levin (chair), K.R.G. Martin, M. Schwartz	Schubert 1
C010	**Teleglaucoma** A. Tuulonen (chair), G. Michelson	Schubert 2
C011	**Genetic testing and counselling for the glaucoma patient** L. Alward (chair),J.E Craig, P.R. Healey	Schubert 3
C012	**Advanced optic nerve imaging (HRT, GDX, OCT) – part 2** H.G. Lemij (chair), R.D. Fechtner, F.A. Medeiros, M.M. Iester, C.F. Burgoyne, R. Burk, M. Fingeret	Stolz 1
C013	**Advances in psychophysical testing for glaucoma patients – part 2** P.A. Sample (chair), J.G. Flanagan, R.S. Harwerth, C.A. Johnson	Stolz 2
C014	**How to detect progression and use it to manage glaucoma – part 2** D.F. Garway-Heath (chair), B.C Chauhan, L.M. Zangwill, A. Heijl	Lehar 2
C015	**Electrophysiology and glaucoma diagnosis** B.F. Fortune (chair), V. Parisi, S.L. Graham	Schubert 4
C016	**Assessment of blood flow in glaucoma** J. Flammer (chair), M. Araie, G.A. Cioffi, A. Harris, S.I. Orgül	Schubert 5
C017	**The role of optic disc photographs in glaucoma management** B. Jonas (chair), P.J. Airaksinen, J. Caprioli, P. Mitchell	Schubert 6
C018	**Visual fields in advanced glaucoma** D. L. Budenz (chair), R.L. Stamper, M. Fingeret	VIP

4.45 – 6.15 pm. POSTER WALKTHROUGH + TECHNICAL EXHIBITION

Parkinson's axioms

1. An official wants to multiply subordinates, not rivals
2. Officials make work for each other

FRIDAY JULY 8, 2005

07.30 – 08.15. 'MEET THE EXPERT' BREAKFAST TABLES (see page 45)

07.30 – 08.15. Room; Schubert 2. CZM Symposium: Case examples illustrating how experts integrate available clinical information. Chair: A. Heijl

07.30 **Beyond structure/function: glaucoma diagnosis and management for the rest of us**
J.B. Jonas, S. Miglior

08.15 **End**

07.30 – 08.15. Room: Schubert 4. Ziemer Ophthalmics Symposium: Dynamic Contour Tonometry and its place in the diagnostic armamentarium. Chair: R. Stamper

07.30 **Precision IOP and the cornea: clinical relevance for glaucoma**
I.K. Ahmed

The effect of corneal biomechanics on tonometry
D.F. Garway Heath

What the ocular pulse amplitude can tell us about glaucoma
A. Harris

Clinical validation of the Dynamic Contour Tonometer: studies on eye bank eyes and on LASIK patients
C. Kniestedt

Visual field defects and Dynamic Contour Tonometry
C. Roberts

08.15 **End**

07.30 – 08.15. Room: Stolz 1. Pfizer Symposium: Integrating risk assessment into clinical practice

07.30 **Rationale for risk assessment: application in ocular hypertension**
R.N. Weinreb

07.50 **How to apply that risk to decision-making**
F. Medeiros

08.10 **Panel discussion**

08.15 **End**

08.30 – 10.00. Plenary Room. Session 6.
Co-chairs: S. Obstbaum, J. Zhao, P.J. Foster

Part A: Angle Closure Glaucoma

08.30 D35 **Diagnosis: gonioscopy**
D.S. Friedman

08.35 D36 **Diagnosis: UBM**
P. RojanaPongpun

08.40 D37 **Diagnosis: OCT**
T. Aung

FRIDAY JULY 8, 2005

08.45 D38 **Differential diagnosis**
P.J. Foster

08.50 D39 **Result of peripheral iridotomy**
R. Thomas

08.55 D40 **What to do after peripheral iridotomy?**
P. Chew

09.00 D41 **Treatment options**
D.S.Friedman

9.05 D42 **A role for cataract extraction?**
D. Lam

09.10 **Panel Discussion, IAQ, Conclusion**

Part B: CCT, risk factors, screening

09.24 **IAQ**

09.26 D43 **CCT should be measured in all patients**
J.D. Brandt

09.31 D44 **CCT should not be measured in all patients**
M. Diestelhorst

09.36 **IAQ**

09.38 D45 **Disk hemorrhages are the most important risk factor**
K. Ishida

09.43 D46 **Disk hemorrhages are not the most important risk factor**
P.J. Airaksinen

09.48 **IAQ**

09.50 D47 **Screening for POAG is feasible**
A. Heijl

09.55 D48 **Screening for POAG is not feasible**
R.P.L. Wormald

09.59 **IAQ and Conclusion**

10.00 – 10.30. BREAK

PARALLEL SESSION

10.30 – 12.00. Plenary Room. Session 7.
Co-chairs: R. Thomas, A. Tuulonen, T. Aung

Part A: Evidence Based and Value Based Medicine

10.30 D49 **Evidence Based and Value Based Medicine**
Roy Wilson

Part B: RCT's

10.38 D50 **New information from OHTS**
R.K. Parrish

10.43 D51 **What do we learn from OHTS for our practice**
P.R. Healey

10.48 D52 **New information from EGPS**
S. Miglior

10.53 D53 **What do we learn from EGPS for our practice**
K. Singh

10.58 D54 **New information from EMGT**
A. Heijl

11.03 D55 **What do we learn from EMGT for our practice**
D. Grigera

11.08 D56 **New information from AGIS**
P. Palmberg

11.13 D57 **What do we learn from AGIS for our practice**
D.S. Minckler

11.18 **Panel Discussion, IAQ, Conclusion**

Part C: Environmental risk factors; role of pressure in glaucoma, Global Guidelines on Diagnosis and Treatment

11.27 D58 **Systemic and environmental factors in open angle glaucoma**
P. Mitchell

11.35 D59 **All glaucoma's have a pressure component**
C.F. Burgoyne

11.40 D60 **Not all glaucoma's have a pressure component**
J. Flammer

11.45 **IAQ**

11.50 D61 **Global Guidelines on Diagnosis and Treatment**
J.M. Liebmann, C. Traverso

12.00 **End**

PARALLEL SESSION

10.30 – 12.00. Lehar 3/4. Session 8. From Science to Clinic. Co-chairs: L.A. Levin, P.T. Khaw, E. Lütjen-Drecoll

10.30 **Introduction**
L.A. Levin

10.35 D62 **Relationship between anterior and posterior segment morphology and pathophysiology**
E. Lütjen-Drecoll

10.43 **Comment**

10.46 D63 **The mouse model in glaucoma research**
J. Crowston

10.56 **Comment**

10.59 D64 **Predictive DNA testing for glaucoma**
J.E. Craig

11.07 **Comment**

11.10 D65 **Auto-antibody profiles in glaucoma**
F.H. Grus

11.18 **Comment**

11.21	D66	**Oxidative damage in glaucoma** G. Tezel
11.29		**Comment**
11.32	D67	**Apoptosis signalling in neurons** L.A. Levin
11.40		**Comment**
11.43	D68	**Gene delivery in experimental glaucoma** K.G.R. Martin
11.51		**Comment**
11.54		**Summary** P.T. Khaw
12.00		**End**

12.00 – 2.00 pm. LUNCH BREAK and SPECIAL MIDDAY SYMPOSIUM

12.05 – 1.05 pm. Room: Plenary Room. Alcon Special Midday Symposium. Co-chairs: R.N. Weinreb, Y. Kitazawa

12.05	**Opening comments** R.N. Weinreb, Y. Kitazawa
	Advancements in the diagnosis of glaucoma F. Medeiros
	24 hr IOP control in glaucoma A.G.P. Konstas
	Improving glaucoma outcomes: past, present and future R.L. Gross
	Improving outcomes: patient management advancements D.S. Friedman
	Surgical advancements F. Grehn
	Q&A Co-chairs
	Closing comments
1.05	**End**

2.00 – 3.00 pm. Plenary Room. Session 9. Glaucoma Society Session. Co-chairs: G.L. Skuta, R. Thomas

2.00	GS3	**Wound healing** P.T. Khaw (EGS)
2.12		**Panel Discussion**
2.30	GS4	**Anterior segment changes after filtering surgery** N.-L. Wang (ChinGS)
2.32		**Panel discussion**
3.00		**End**

FRIDAY JULY 8, 2005

2.00 – 3.00 pm. PARALLEL COURSES

C019 **Gonioscopy versus UBM and OCT for chamber angle evaluation – part 1**
C.E. Traverso (chair), G. Marchini, P.J. Foster, W.L.M. Alward, J. Liebmann — Lehar 1

C020 **New tonometry/CCT/continuous IOP measurement – part 1**
J.D. Brandt (chair), M. Diestelhorst, Y. Kuwayama, Y. Lachkar, L.E. Pillunat, P. Shah — Stolz1

C021 **Guidelines on diagnosis and treatment of acg – part 1**
S. Friedman, T. Aung, P.J. Foster, D. S-C. Lam, P. Rojanapongpun, R. Thomas, N-L. Wang, J. Zhao — Stolz 2

C022 **Principles of medical therapy in glaucoma practice – part 1**
G. Holló, C.B. Camras, C.A. Girkin, C. Migdal, S. Miglior, J. Thygesen — Lehar 2

3.15 – 4.15 pm. PARALLEL COURSES

C023 **Guidelines for the diagnosis and treatment of POAG: individualizing glaucoma management**
A. Tuulonen (chair), A. Heijl, E.L. Greve — Plenary Room

C024 **Experimental models of glaucoma**
J.D. Lindsey (chair), J.A. Cioffi, R.S. Harwerth — Lehar 3

C025 **Normal pressure glaucoma**
R. Hitchings (chair), M. Aihara, Y. Kitazawa, T. Krupin — Lehar 4

C026 **Congenital and infantile glaucoma**
P.T. Khaw (chair), M.S. Jafaar — Schubert 1

C027 **Exfoliation syndrome and exfoliative glaucoma**
R. Ritch (chair), G. Anastasios, A.G.P. Konstas, U. Schlötzer-Schrehardt — Schubert 2

C028 **Glaucoma and uveitis**
K. Barton (chair), S. Gandolfi — Schubert 3

C029 **Gonioscopy versus UBM and OCT for chamber angle evaluation – part 2**
C.E. Traverso (chair), G. Marchini, P.J. Foster, W.L.M. Alward, J. Liebmann — Lehar 1

C030 **New tonometry/CCT/continuous IOP measurement – part 2**
J.D. Brandt, M. Diestelhorst, Y. Kuwayama, Y. Lachkar, L.E.Pillunat, P. Shah — Stolz 1

C031 **Guidelines on diagnosis and treatment of ACG – part 2**
S. Friedman (chair), T. Aung, P.J. Foster, D. S-C. Lam, P. Rojanapongpun, R. Thomas, N-L. Wang, J. Zhao — Stolz 2

C032 **Principles of medical therapy in glaucoma practice – part 2**
G. Holló (chair), C.B. Camras, C.A. Girkin, C. Migdal, S. Miglior, J. Thygesen — Lehar 2

C033 **Glaucoma in systemic diseases**
J. Flammer (chair), D. Gherghel, K. Kashiwagi, M. Pache — Schubert 4

C034 **Practical digital slit lamp photography - a practical guide to optic disc, angle and bleb photography**
A.P. Wells (chair), F.H. Grus, W. Birchall, B.C. Little — Schubert 5

C035 **Medical therapy principles**
A. Alm (chair), A. Azuara-Blanco, R.D. Fechtner, P. Kaufman, J. Thygesen — Schubert 6

C036 **Neuroprotection and apoptosis of retinal ganglion cells related to glaucoma**
L. Levin (chair), M.F. Cordeiro, N.N.Osborne, G. Tezel — VIP

4.30 – 6.00. POSTER SESSION — PLENARY ROOM

SATURDAY JULY 9, 2005

PARALLEL SESSION

09.00 – 10.00. Plenary Room. Session 10. Medical Treatment. Co-chairs: A. Alm, J.M. Liebmann, M.B. Shields

09.00	D69	**Mechanisms of action of glaucoma medication** P.L. Kaufman
09.08		**Comment** A. Alm
09.10	D70	**Prostaglandins are first choice** G.L. Skuta
09.15	D71	**Prostaglandins are not first choice** Y. Kuwayama
09.20		**Panel Discussion, IAQ, Conclusion**
09.27	D72	**Is there a place for combination drops?** R.D. Fechtner
09.32		**Comment** G. Holló
09.35	D73	**Maximum medical therapy** S. Gandolfi
09.40		**Comment** J.M. Liebmann
09.43		**Panel discussion, IAQ, Conclusion**
09.50	D74	**Target IOP is useful** C. Migdal
09.55	D75	**Target IOP is not useful** J. Caprioli
10.00		**End**

PARALLEL SESSION

09.00 – 10.00. Lehar 3/4. Session 11. Co-chairs: G.A.Cioffi, S. Gandolfi, M. He

Part A: Alternative treatment modalities

09.00	D76	**What is the evidence to support glaucoma neuroprotection?** L.A. Wheeler
09.08	D77	**Yes, there are other ways to treat glaucoma** L.A. Levin
09.13	D78	**There are no other ways to treat glaucoma** H. Tanihara
09.18		**IAQ**

Part B: Laser Treatment

09.25	D79	**ALT and SLT are the same** L.J. Katz
09.30	D80	**ALT and SLT are different** A.D. Realini

09.35		**Panel Discussion, IAQ**
09.42	D81	**LTP should be initial treatment of OHT or glaucoma** G.L. Spaeth
09.47	D82	**LTP should not be initital treatment of OHT or glaucoma** C.B. Camras
09.52		**Discussion, IAQ, Conclusion**
10.00		**End**

10.00 – 10.30. BREAK

PARALLEL SESSION

10.30 – 12.00 pm. Plenary Room. Session 12. Glaucoma Surgery Consensus. Co-chairs: R.N. Weinreb, F. Grehn, P.T. Khaw

10.30	D83	**Introduction** R.N. Weinreb
10.33	D84	**Indications for surgery** R.D. Fechtner
10.36	D85	**Laser trabeculoplasty** D.S. Minckler
10.39	D86	**Wound healing** J. Crowston
10.42	D87	**The future of wound modulation** P.T. Khaw
10.47		**Discussion / IAQ**
10.57	D88	**Trabeculectomy** J.M. Liebmann
11.00	D89	**How does non penetrating filtering surgery work** T. Shaarawy
11.05	D90	**Non Penetrating Glaucoma Drainage Surgery (NPGDS)** R.G. Carassa
11.08	D91	**Comparison of trabeculectomy *versus* NPGDS** I. Goldberg
11.11		**Discussion / IAQ**
11.21	D92	**Combined cataract and glaucoma surgery** G.A. Cioffi
11.24		**Discussion / IAQ**
11.29	D93	**Glaucoma Drainage Devices (GDD)** A.L. Coleman
11.32	D94	**Comparison MMC trabeculectomy *vs* GDD** F. Grehn
11.35		**Discussion / IAQ**
11.45	D95	**Cyclodestruction** D. Lam
11.48	D96	**Comparison GGDs *versus* cyclodestructive procedures** K. Singh

11.51 **Discussion / IAQ**

11.56 **Consensus conclusions and consequences for clinical practice**
R.N. Weinreb

12.00 **End**

PARALLEL SESSION

10.30 – 11.45. Lehar 3/4. Session 13. Co-chairs: T. Krupin, N. Pfeiffer, A.B. Hommer. Comments by T. Dietlein, D.K. Heuer

Part A: Glaucoma Surgery Videos: Incisional Surgery

10.30 D97 **Viscocanalostomy**
R.G. Carassa

10.35 **Comment**

10.38 D98 **Deep sclerectomy**
A. Mermoud

10.43 **Comment**

10.46 D99 **Fornix based trabeculectomy**
P. Palmberg

10.51 **Comment**

10.54 D100 **Limbus based trabeculectomy**
Rick Wilson

10.59 **Comment**

11.02 D101 **Management of small pupils**
N. Pfeiffer

11.07 **Comment**

11.10 D102 **Zonular laxity, dehiscence**
I.K.Ahmed

11.15 **Comment**

11.18 D103 **Capsular tension rings**
A.S. Crandall

11.23 **Comment**

11.26 D104 **Combined cataract and glaucoma surgery**
P. Palmberg

11.31 **Comment**

11.34 D105 **Glaucoma drainage device and cataract surgery**
D.L. Budenz

11.39 **Comment**

11.42 **End**

12.00 – 2.00 pm. LUNCH BREAK and SPECIAL MIDDAY SYMPOSIUM

12.15 – 1.15 pm. Room: Plenary Room. Allergan Special Midday Symposium: Optic Nerve in Focus. Co-chairs: R.A. Hitchings, R.N. Weinreb

12.15 **Individual treatment & future for glaucoma management**
Chairmen

Glaucoma progression
A. Heijl

Joint session: See me – Save me. Early detection of glaucoma (IAQ)
R. Susanna, I. Goldberg, R.N. Weinreb

Management of the patient at risk
L. Rossetti

Beyond IOP benefits of neuroprotection
L.A. Levin

Discussion

1.15 **End**

2.00 – 3.00 pm. Plenary Room. Session 14. Glaucoma Society Session. Co-chairs: C. Migdal, TBD

2.00	GS5	**Normal tension glaucoma** T. Yamamoto (JGS)
2.12		**Panel Discussion, IAQ**
2.30	GS6	**Perimetry after surgery in late stages of glaucoma** J.F. Casiraghi (LAGS)
2.32		**Panel Discussion, IAQ**
2.59		**End**

2.00 – 3.00 pm. PARALLEL COURSES

C037	**Optimizing trabeculectomy outcome: intraoperative techniques – part 1** F. Grehn (chair), K. Barton, P.T. Khaw, J. Liebmann, P. Shah	Stolz 1
C038	**Filtering surgery: penetrating/non-penetrating/implants – part 1** T. Shaarawy (chair), T. Dietlein, A. Mermoud, D.S. Minckler, P. Palmberg, C.E. Traverso, R.P. Wilson	Stolz 2
C039	**Managing cataract and glaucoma – part 1** J.C. Caprioli (chair), I.K. Ahmed, A.S. Crandall, D. S-C. Lam, K.F. Tomey, C.E.Traverso	Lehar 1
C040	**Laser surgery of the iris and the angle: IPI-ALT iridoplasty** Y. Lachkar (chair), J. Katz, T. Realini, J. Thygesen	Lehar 2

3.15 – 4.15 pm. PARALLEL COURSES

C042	**The use of releasable sutures in glaucoma surgery** R.P. Wilson (chair), J.S. Cohen	Lehar 3
C043	**Fibrosis inhibition with filtration surgery** P.T. Khaw (chair), C. Baudouin, J. Crowston, B.E.Prum	Lehar 4
C044	**Safe and effective glaucoma drainage device implantation** D. Minckler (chair), D.L. Budenz, R. Susanna, D.K. Heuer	Schubert 1
C045	**Pediatric glaucoma surgery** N. Pfeiffer (chair), F. Grehn, M.S. Jaafar, K.F. Tomey	Schubert 2
C046	**Cyclophotocoagulation – why, when and how?** P. Bloom (chair), D.K. Heuer, R. Susanna	Schubert 3

C047 **Optimizing trabeculectomy outcome: postoperative management – part 2**
F. Grehn (chair), K. Barton, P.T. Khaw, J. Liebmann, P. Shah — Stolz 1

C048 **Filtering surgery: penetrating/non-penetrating/implants – part 2**
T. Shaarawy (chair), M. Dietlein, A. Mermoud, D.S. Minckler, P. Palmberg, C.E. Traverso, R.P. Wilson — Stolz 2

C049 **Managing cataract and glaucoma – part 2**
J.C. Caprioli (chair), I.K. Ahmed, A.S. Crandall, D. S-C. Lam, K.F. Tomey, C.E.Traverso — Lehar 1

C050 **Size matters: intraocular surgery in highly miopic or nano-phthalmic eyes**
D.E. Grigera (chair), R Gross, H. Tanihara — Schubert 4

C051 **Surgical treatment of glaucoma**
J. Ge (Chair), N. Wang, J. Zhao, X. Zhang, M. He, X. Sun — Schubert 5

4.30 – 5.30 pm. Plenary Room. Session 15. Closing Symposium Young Clinician Scientists: The Future of Glaucoma. Co-chairs: R.A. Hitchings, R.N. Weinreb

4.30 **Introduction**
R.N. Weinreb

4.31 D106 **Molecular genetics of primary congenita glaucoma: The Indian scenario**
S. Chakrabarthi

4.39 D107 **New directions for glaucoma genetic research**
A.C. Viswanathan

4.47 D108 **Perspectives in glaucoma: from cell biology to epidemiology**
P.R. Healey

4.55 D109 **Will my patient develop glaucoma? Risk assessment in ocular hypertension**
F. Medeiros

5.03 D110 **New frontiers in angle closure glaucoma research**
T. Aung

5.11 D111 **New possible medical therapy for glaucoma**
M. Honjo

5.19 D112 **The future of glaucoma research**
R.N. Weinreb

5.23 D113 **The future of glaucoma**
R.A. Hitchings

5.30 **End**

Peter's Placebo

An ounce of image is worth a pound of performance

CURRICULUM VITAE

Special Guest and Opening Speaker:

Dr. Otto von Habsburg
Archduke Otto was born in Reichenau (Lower Austria) on 20th November 1912 as the oldest son of Archduke Carl of Austria (later Emperor Karl I. of Austria, King of Hungary, Bohemia, Croatia etc.) and of Princess Zita de Bourbon-Parma (later Empress and Queen). He was baptized Franz Joseph Otto Robert Maria Anton Karl Max Heinrich Sixtus Xavier Felix René Ludwig Gaetano Pius Ignazius by the Cardinal Of Vienna. From 1916 on he was the Crown Prince of Austria-Hungary.
Until the end of the first world war, 1918, he lived in Austria-Hungary. After that, because of the special anti-Habsburg laws, in exile in Switzerland, on Madeira, at Lequeitio (Spain), at Steenockerzeel (Belgium), in Paris, and from 1940 to 1944 in Washington D.C. (USA). 1944 he returned to Europe, lived in France and since 1954 in Pöcking (Bavaria). A return to Austria became only possible, after a law-dispute of many years, in 1966 by a judgement of the Administration Court of Justice.
Studies: Otto von Habsburg finished his high school studies in Spain on the basis of the Austrian and the Hungarian school programme. Studies of political and social sciences at the University in Louvain (Belgium), finishing it with a doctorate in 1935.
Scientific and publishing activities: Otto von Habsburg published 35 books in nine languages on historical, social and political topics and particularly on European politics. Also numerous contributions to books, periodicals and newspapers. Since 1953 a weekly chronicle regarding present events appears from him in many daily papers in several languages.
Political activities: In the 1930-ies Otto von Habsburg openly objected the National-Socialism and opposed March 1938 the annexation ('Anschluss') of Austria by the German Reich. The Nazis pursued him with a warrant for his arrest. At the outbreak of the war he helped more than ten thousand NS-persecuted people, mainly Jews, to escape to overseas. During the second world war he worked in the USA for the restoration of Austria, the self-determination of Southern Tirol and against the expulsion of the Germans from the Sudeten area and from the German Eastern regions. After the war he was again expelled from Austria at the pressure of the Soviet Occupation Forces.
Since 1936 Otto von Habsburg is a member of the Richard Coudenhove-Kalergi founded Paneuropean-Union, and since 1957 its International Vice-President. After the death of the founder he took over in 1973 as International President the direction of the Paneuropean-Union. He developed the organization into a mass-movement for a free, Christian, social and united Europe and made it into the advocate for the people of Central- and Eastern-Europe suppressed by communist regimes.
Otto von Habsburg became a Member of the European Parliament at the first direct election on 10th June 1979. There he was until July 1999 Chairman of the Christian-Democratic EVP-Faction in the External Affairs Commission, President *i.e.* Vice-President of the Hungarian Delegation and also active as the Parliament's Age-Doyen. The putting up of an empty seat for the oppressed people of Europe, the re-discovery of the term Central-Europe, the development of common external and security politics and the opening possibility for the countries of Central- and Eastern-Europe to join the European Union, carry his handwriting. He was the commentator for Spain's entry into the EG of the time, for the negotiation and cooperation agreement with Marokko and for the EU-accession of Hungary.
Since 1989 he worked on the extension of the Paneuropean Union into the countries behind the 'Iron Curtain', on the independence of the Baltic States from Moscow, and of Croatia, Slovenia, Bosnia-Herzgovina and Macedonia from Belgrade. On 19th August 1989 he was the Patron of the 'Paneuropean-Picnic' in Sopron, at which 661 Germans from the 'DDR' dared to make the first great escape of the masses.
Memberships and academic honours: Academie des Sciences Morales et Politiques, Institut de France in Paris; Real Academia de Ciencias Morales y Politicas in Madrid; Academia da Cultura Portuguesa in Lisbon; Academia Mejicana de Derecho Internacional in Mexico; Academie du Royaume du Maroc; Professor h.c. of the University of Bogota (Columbia); Honorary Member of the Instituto de Estudios da Marinha (Portugal); Honorary Fellowship of the University of Jerusalem; Dr. h.c. of the Universities of Nancy, Tampa, Cincinnati, Ferrara, Pécs/Fünfkirchen, Budapest, Turku, Osijek and Skopje.
Ordres and Decorations; Grand Cross of the Papal Order of Gregory the Great with Cordon and Star; Bavarian Order of Merit (Bayerischer Verdienstorden), Grand Cross of the Luxemburg Ordre of the Golden Lion; Grand Cross of the Order Carlos III of Spain; Orden de Africa; Federal Distinguished Service Cross (Bundesverdienstkreuz) of the Federal Republic of Germany; Order of King Zvonimir of Croatia; 'Marjaa Maa Orden' of Estonia; Grand Cross of the Order of Merit of the Republic of Hungary; European Karls-Preis of the Sudeten-German Landsmannschaft; Médaille de Mérite Européen of Luxemburg; Gold Medal Robert-Schuman; European Award Coudenhove-Kalergi, Commandant de la Légion d'Honneur etc.

CURRICULUM VITAE

Special Guest

Gullapallin N. Rao, M.D. , Diplomate of American Board, FACS, FRCS, FNAMS, D.Sc.
Title and Affiliation: Chairman, Board of Trustees and President, International Agency for the Prevention of Blindness, Distinguished Chair of Eye Health, L V Prasad Eye Institute, Hyderabad, India; Adjunct Professor, University of New South Wales, Australia (1993-) Clinical Professor of Ophthalmology, University of South Carolina, Columbia, USA (1997-), Adjunct Professor of Ophthalmology, University of Rochester, USA (2002-), formerly Associate Professor of Ophthalmology, and Director, Cornea Research Laboratory, University of Rochester, Rochester, New York and Medical Director, Rochester Eye Bank.
Research Interests: Diseases of cornea and community eye health.
Leadership Positions: Chairman-Board of Trustees and President International Agency for the Prevention of Blindness (2004-).
Special Honors: Padma Shri from the Government of India – 2002 (Republic Day Honours given by the President of India), Rustom Merwanji Alpaiwalla Memorial Award by National Association for the Blind (2003), Vocational Excellence Award by Rotary International (2003), First 'Global Visionary in Ophthalmology' Award presented by Bausch & Lomb (2003), Fellow *qua* Surgeon *ad eundem* of the Royal College of Physicians and Surgeons of Glasgow (2003); HRH Prince Abdulaziz bin Ahmed bin Abdulaziz Al-Saud Award for the Prevention of Blindness Award.

CURRICULA VITAE

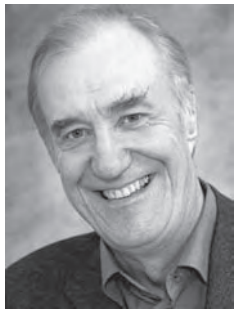
NB. Many of these short CV sketches are no more than the tip of an iceberg of many pages with affiliations, honors, rewards, published literature etc.. It would be impossible to publish all CV material we received. The CV sketch may have missed important information.

Ike K. Ahmed, MD, FRCS(C), DABO
Ike K. Ahmed, MD is a fellowship-trained glaucoma, cataract, and anterior segment surgeon practicing in Toronto, Ontario. Surgical management of glaucoma, the complex cataract and management of cataract complications are his areas of subspecialty expertise.
Dr. Ahmed has a keen interest in the development of advanced microsurgical techniques in glaucoma surgery and complicated cataract extraction, and is actively involved in research and medical education at a national and international level. He has received research grants to study glaucoma medications, glaucoma laser and surgical techniques, optic nerve imaging in glaucoma, cataract surgical techniques and devices, and intraocular lens designs. Dr. Ahmed has designed innovative glaucoma diamond scalpels for surgery, microsurgical instrumentation, and devices, implants, and techniques for the management of the dislocated cataract.
Dr. Ahmed is the Director of the upcoming third International Congress on Glaucoma Surgery in May 2006 in Toronto. He is currently an Assistant Professor at the University of Toronto, and a Clinical Assistant Professor at the University of Utah.

Makoto Araie, M.D., Ph.D.
Title and Affiliation: Assistant Professor, Department of Ophthalmology, Faculty of Medicine, University of Tokyo, Japan.

Research Interest: Glaucoma, Normal-tension glaucoma, Ocular blood flow, Ocular pharmacokinetics, Neuroprotection.
Special Honors: Alcon Research Institute's Award (1993), Japanese Eye Bank Fellowship (2001), Suda memorial Fund for Glaucoma Research in Japan (2003), Imai Memorial Fund for Glaucoma Research in Japan (2004).

P. Juhani Araksinen, MD, PhD
Title and Affiliation: Professor and Head, Department of Ophthalmology and the Oulu University Eye Hospital, Oulu, Finland.
Research Interest: Medical and Surgical Glaucoma.



Albert Alm, M.D., Ph.D.
Title and Affiliation: Professor, Department of Ophthalmology, Uppsala University, Uppsala, Sweden.
Research interest: Glaucoma, Ocular blood flow.
Awards: Alcon Research Institute´s Award for 1994.

Wallace L.M. Alward, M.D.
Title and Affiliation: Professor of Ophthalmology, Director, Glaucoma Service, University of Iowa College of Medicine.
Research interests: The molecular genetics of glaucoma; Pigmentary glaucoma; Normal tension glaucoma; Axenfeld-Rieger syndrome; Gonioscopy.
Leadership positions: Vice Chairman of Ophthalmology, University of Iowa; Director, Research Committee, American Glaucoma Society; Editorial Board, American Journal of Ophthalmology; Editorial Board, Journal of Glaucoma; Editorial Board, International Glaucoma Review.
Special honors: Listed in *One Hundred Important Ophthalmology Books of the 20th Century* (Color Atlas of Gonioscopy). Thompson HS and Blanchard DL, Archives of Ophthalmology 119:761-763, 2001; 5th American Glaucoma Society Clinician – Scientist Lecture (2004); Lew R. Wasserman Award – Research to Prevent Blindness (2004).

Tin Aung, FRCSEd, FRCOphth, PhD (Lond)
Affiliations: Consultant Ophthalmologist, Glaucoma Service, Singapore National Eye Centre, Consultant Ophthalmologist, National University Hospital, Singapore, Assistant Professor, Department of Ophthalmology, National University of Singapore, Associate Director, Singapore Eye Research Institute
Research interests: Main research interests: angle closure glaucoma and the molecular genetics of eye diseases.

Augusto Azuara-Blanco, Ph.D., FRCS (Ed)
Affiliations: Aberdeen Royal Infirmary (NHS Grampian) and University of Aberdeen, UK
Research interests: Diagnosis of glaucoma, evidence-based medicine, quality of life, health economics, ocular surface.
Leadership positions: Consultant Ophthalmic Surgeon, Aberdeen Royal Infirmary; Honorary Senior Lecturer, University of Aberdeen; Member of the editorial board of

two peer-reviewed journals; Member of the scientific committee of the International Glaucoma Association
Special honors: Fellowship of the Royal College of Surgeons of Edinburgh (awarded without examination)

Keith Barton MD FRCP FRCS FRCOphth
Affiliation: Consultant Ophthalmologist, Glaucoma Service Director, Moorfields Eye Hospital, 162 City Road London EC1V 2PD, United Kingdom
Research interest: Secondary glaucomas especially uveitic glaucoma, Glaucoma surgery, especially Aqueous Shunt Devices.
Leadership positions: Clinical Director of the Glaucoma Service, Moorfields Eye Hospital, Trustee of the International Glaucoma Association.

Christophe Baudouin, MD,PhD (France)
Title ands Affiliations: Professor of Ophthalmology, the head of the department of Ophthalmology, Ambroise Paré Hospital, APHP, University of Versailles, and the head of the Department III of Quinze-Vingts National Ophthalmology Hospital, Paris.
Research Innterest: Dry eye, ocular allergy, toxic sid-effects induced by topical treatments, especially in glaucoma.
Leadership positions: Editor-in-chief of the French Journal of Ophthalmology, President of the Ophthalmological Society of Paris and member of eight international societies.

Wayne Birchall, FRCOpht
Title: Glaucoma Fellow
Affiliation: Ophthalmology Dept, Wellington Hospital, Wellington, New Zealand
Research interests: Surgical techniques in trabeculectomy, Ultrasound biomicroscopy

Philip Bloom, FRCS FRCOphth
Affiliations: Consultant Ophthalmic Surgeon, Western Eye & Hillingdon Hospitals, Honorary Senior Lecturer, Imperial College School of Medicine
Research Interests: Cyclophotocoagulation, Spectacle independence following cataract surgery
Leadership positions / special honours: Lead Clinician and Service Director, Western Eye Hospital

Head of Glaucoma services, Hillingdon Hospital, Vice President, Ophthalmology section, Royal Society of Medicine, Course Leader, Post-Graduate Diploma in Ophthalmology (Middlesex University).

Eytan Z. Blumenthal, MD
Title and Affiliations: Lecturer, Department of Ophthalmology, The Hebrew Universit-Hadassah Medical School, Jerusalem; Director of teaching activities, Department of Ophthalmology, The Hebrew University-Hadassah Medical School, Jerusalem; Head Glaucoma Service, Hadassah University Hospital, Jerusalem, Israel.

James D. Brandt, M.D.
Title: Professor & Director, Glaucoma Service
Affilliation: Department of Ophthalmology & Vision Science, University of California, Davis
Research Interest: Pachymetry & tonometry techniques and their impact on clinical trials; Trabecular Meshwork physiology; New drug development (basic and clinical); Infantile and Pediatric glaucoma.
Leadership Positions: Editorial Board, Ophthalmology; Program Chair, American Glaucoma Society; Board of Directors, Glaucoma Research Foundation.
Special Honors: Senior Achievement Award, American Academy of Ophthalmology (2004); Secretariat Award, American Academy of Ophthalmology (2004)

Donald L. Budenz, MD, MPH
Title: Associate Professor
Affiliation: Department of Ophthalmology, Epidemiology, and Public Health, University of Miami School of Medicine, Bascom Palmer Eye Institute.
Research interests: Diagnosis of glaucoma and glaucoma progression; management of glaucoma
Leadership positions: Associate Medical Director, Anne Bates Leach Eye Hospital

Claude F. Burgoyne, M.D.
Titleand Affiliation: Professor of Ophthalmology and Neuroscience, Director, Glaucoma Service, Louisiana State University Health Sciences Center, School of Medicine, New Orleans, Louisiana, U.S.A.
Leadership positions: Editor Current Eye Research, Canadaian Journal of Ophthalmology, International Advisory Board.
Special honors: Member by Invitation, The Glaucoma Society of the International Congress of Ophthalmology (2003); Named to the New Orleans Top Doctors List by Best Doctors, Inc, New Orleans Magazine (2004)

Reinhard Burk, M.D., Ph.D.
Title: Professor Dr. med. Dr. med. habil.
Affilation: Department of Ophthalmology, Städtische Kliniken Bielefeld, An der Rosenhöhe 27, D- 33647 Bielefeld, Germany.

Teaching position: Department of Ophthalmology, University of Heidelberg, Department of Ophthalmology, Städtische Kliniken Bielefeld.
Research interest: Development of three-dimensional optic nerve head structure analysis by Laser Scanning Tomography (HRT); Surgical modifications of deep sclerectomy and viscocanalostomy by irrigation trabeculotomy and ab externo laser trabeculotomy (US patent).
Leadership Positions: 1992-2001 Vice Director, Department of Ophthalmology, University of Heidelberg; since 2001 Director and Head, Department of Ophthalmology, Kliniken Bielefeld
Awards: "Glaukompreis" of the Deutsche Ophthalmologische Gesellschaft DOG
Member of the Glaucoma Society of the International Congrss of Ophthalmology GSICO

Carl B. Camras, MD, FACS
Title and Affiliation: Professor and Chairman, Director of the Glaucoma Service, Department of Ophthalmology, University of Nebraska Medical Center, Omaha, Nebraska, U.S.A.
Research Interest: Gaucoma, with special emphasis on glaucoma pharmacology and aqueous humor dynamics.

Joseph Caprioli, M.D.
Title and Affiliation: Professor of Ophthalmology, UCLA School of Medicine
Special honors: Research to Prevent Blindness Physician Scientist Award (2002); Secretariat Award, American Academy of Ophthalmology (2004); Certificate of Appreciation, American Academy of Ophthalmology, for outstanding contributions to Quality of Care (2005).

Roberto G. Carassa M.D.
Title and Affiliation: Chief Glaucoma Service, Dept. Ophthalmology and Visual Sciences, H S. Raffaele, Milano, Italy.
Research Interests: Early glaucoma Diagnosis by Image analysis of the optic disc; New lasers applications in glaucoma; New drugs for medical glaucoma treatment; New non-penetrating surgery for glaucoma.
Leadership positions: Editor-in-chief of the Journal Rivista Trimestrale di Oftalmologia;Member of the Scientific Editorial Board of the European Journal of Ophthalmology; Member of the International Editorial Board of the Journal Ocular Surgery News: Europe/Asia Pacific Edition.

Javier F. Casiraghi, M.D.
Affiliation: Department of Ophthalmology, University of Buenos Aires, Argentine
Research interest: New surgicals procedures, devices, perimetry, farmacology.
Leadership positions: Chief, Glaucoma Service; Hospital de Clínicas – School of Medicine, University of Buenos Aires; Coordinator of The postgraduate course in glaucoma of The Favaloro University.
Special honors: President of The Argentine Glaucoma Society; Courses Director of The Argentine Council of Ophthalmology; Executive secretary of The Panamerican Glaucoma Society; Delegate of The Latin American Glaucoma Society.

Subhabrata Chakrabarti, Ph.D.
Affiliation: Brien Holden Eye Research Centre, L.V. Prasad Eye Institute, Hyderabad, 500034, India
Research interest: Understanding the molecular genetics of complex eye diseases like glaucoma, myopia and AMD; Gene mapping and association studies based on DNA markers; Devising molecular diagnostics in inherited eye diseases; Evolutionary biology and migration of disease genes in populations.

Leadership positions: Staff scientist in molecular genetics at the LV Prasad Eye Institute; Group leader in glaucoma genetics study; Coordinator of the international myopia genetics study; Principal investigator in joint US-Indo projects on glaucoma research; Principal investigator in molecular diagnostics of eye and vision projects.
Special honors: Clinician Scientist Award of the AIGS in 2005; ARVO Collaborative Research Grant in 2005; Bausch and Lomb Travel fellowship for SERI-ARVO in 2005; International Society for Eye Research (ISER) Travel fellowship (USA) in 2004; VisionCRC (Australia) Research grant in 2004; International Travel Bursary of the International Genetics Federation, USA, in July 2003; Associate of the Indian Academy of Sciences from 2004-2007.

Balwantray Chauhan
Title and Affiliation: Professor, Research Director and Chair in Vision Research, Department of Ophthalmology and Visual Sciences, Dalhousie University, Halifax, N.S. Professor, Department of Physiology and Biophysics, Dalhousie University, Halifax, N.S. Affiliated Scientist, Queen Elizabeth II Health Sciences Centre, Halifax, N.S., Canada.

Research Interests: Structural and functional changes in glaucoma; Risk factors for the progression of glaucoma; Novel analytical techniques; Experimental optic nerve damage.
Leadership positions: Programme Planning Committee, Glaucoma Section, Association for Research in Vision and Ophthalmology; Scientific Officer, Clinical Investigation (A) Committee, Canadian Institutes of Health Research; Scientific Advisory Committee, Glaucoma Research Foundation; Public Health Committee, Canadian Ophthalmological Society
Special Honours: Chair in Vision Research, Dalhousie University; Clinical Research Scholar, Dalhousie University; Joint International Glaucoma Societies recognition for top ten publications in glaucoma in 2003 (Vesti et al: *Invest. Ophthalmol. Vis. Sci.* 44:3873-3879, 2003); Wilmer Distinguished Lecturer, February 2004; Joint International Glaucoma Societies recognition for top ten publications in glaucoma in 2001 (Chauhan *et al: Arch. Ophthalmol* 119:1492-1499, 2001).

Paul Chew Tec Kuan, MBBS, MMed (Ophthalmology), FRCS (Ed), FRCOphth, FAMS

Title: Associate Professor, National University of Singapore
Affiliation: Clinical Teacher, Faculty of Medicine, National University of Singapore; Head Glaucoma Service, The Eye Institute, National Healthcare Group; Chief, Department of Ophthalmology, National University Hospital; Senior Consultant, Singapore National Eye Centre; Co-Head, Glaucoma Services, Singapore National Eye Centre.
Research Interest: Laser in Glaucoma research-reatment of Angle Closure Glaucoma (ACG); Accomodative Intra-Ocular Lens (IOL) and presbyopic correction; Anterior segment imaging in relation to Angle Closure Glaucoma (ACG); Medication in Angle Closure Glaucoma (ACG); Brimonidine as a neuro-protective agent in acute primary angle closure glaucoma; Epidemiology of eye disease, risk factors analysis of eye diseases.

George A. (Jack) Cioffi, MD

Title and Affiliation: Chief of Ophthalmology and Director of the Glaucoma Service at Devers Eye Institute, Legacy Health System, Portland, Oregon, U.S.A.
Leadership Positions: Board certified by the American Board of Ophthalmology and is Co-Editor of the Journal of Glaucoma. Editorial board of Focus on Glaucoma, and Graefe's Archives of Ophthalmology. President of the Oregon Academy of Ophthalmology. He also serves on the FDA Ophthalmology/Dermatology Advisory Committee, the Executive Committee of the American Glaucoma Society, the Ocular Hypertension Treatment Study, the Prevent Blindness America Glaucoma Advisory Committee, Chair Scientific Advisory Committee of the Glaucoma Research Foundation, and is Past Chairman of the ARVO, Glaucoma Program Committee.

John S. Cohen, M.D.

Title and Affiliation: Chief Glaucoma Service, Cincinnati Eye Institute, Clinical Professor, VOL., Department of Ophthalmology, University of Cincinnati, Cleveland, Ohio, U.S.A.
Leadership Positions: Clinical Professor – Department of Ophthalmology, University of Cincinnati, College of Medicine.

Anne L. Coleman, MD, PhD

Title and Affiliation: Professor of Ophthalmology, Frances & Ray Stark Chair in Ophthalmology
Jules Stein Eye Institute, David Geffen School of Medicine at UCLA, Los Angeles, California, U.S.A.
She became the Director of the Jules Stein Eye Institute Center for Eye Epidemiology in 1998, Director of the Jules Stein Eye Institute Mobile Eye Clinic in 2000, and a Professor of Ophthalmology and Epidemiology at UCLA in 2003. In 2004, she was the recipient of the Frances and Ray Stark Endowed Chair at UCLA and Senior Achievement and Secretariat awards from the American Academy of Ophthalmology. She is President of Women in Ophthalmology, a member of the US Food and Drug Administration Ophthalmic Devices Panel, an investigator of the Ocular Hypertension Treatment Study, a member of the American Academy of Ophthalmology Health Policy Committee, a member of the US Cochrane Collaboration Eyes and Vision Steering Group and the Chair of the American Academy Of Ophthalmology's Glaucoma Knowledge-Based Panel. Dr. Coleman is currently Principal Investigator of a collaborative multi-site study funded by the National Eye Institute on the incidence of age-related macular degeneration in elderly women. She has authored or coauthored more than 60 peer-reviewed publications and has given numerous national and international lectures.

Maria Francesca Cordeiro

Title and Affiliation: Institute of Ophthalmology and Moorfields Eye Hospital, Bath Street, London EC1V 9EL United Kingdom
Leadership Positions: Head of Research Group investigating molecular and mechanical mechanisms of glaucoma and retinal neurodegeneration; Wellcome Trust University Lecturer Award; Institute of Ophthalmology, UCL in assoc. with Moorfield's Eye Hospital; Visiting Professor, New York Eye & Ear Infirmary, New York *Special Honours*: International Glaucoma Review Prize for best research paper in glaucoma published worldwide 1999-2000; Wellcome Trust University Award (2001)

Jamie E Craig

Title and Affiliations: Associate Professor Ophthalmology, Flinders University, Consultant Ophthalmologist, Flinders Medical Centre; Australian NHMRC Practitioner-Fellow; Department of Ophthalmology, Flinders University, South Australia, 5042
Research Interests: Glaucoma Genetics, Cataract Genetics
Leadership Positions: Head Glaucoma Clinic – Flinders Medical Centre
Special Awards: Senior Achievement Award American Academy of Ophthalmology (2003);
Director of International Relations American Society of Cataract and Refractive Surgery (2003).

Jonathan Crowston MBBS, FRCOphth, PhD

Affiliation: Hamilton Glaucoma Center, University California San Diego
Research interest: Wound Healing, Apoptosis, Mouse glaucoma models, Aqueous humor dynamics.
Special honors: Pfizer Fellows Award for excellence in glaucoma research, USA (2004);
Keeler Scholarship, Royal College of Ophthalmologists, UK (2003); Foulds Trophy, Royal College of Ophthalmologists, UK (1998); Wellcome Trust Vision Research Fellowship, UK (1995).

Michael Diestelhorst, M.D.

Title and Affiliation: Professor of Ophthalmology, University of Cologne, Cologne, Germany.
Research Interest: Glaucoma surgery, ocular pharmacology, fluorophotometry.
Special honors: Glaucoma Award, German Society of Ophthalmology (1993); Research Cup, European Glaucoma Society (2000).

Thomas Dietlein, M.D.

Title and Affiliation: Assoc. Professor, Department for General Ophthalmology, University of Cologne, Cologne, Germany.
Research Interest: Trabecular microsurgery in glaucoma, the developmental glaucomas and cataract surgery combined with glaucoma or vitreoretinal surgery.

Robert D. Fechtner, M.D.

Title and Affiliation: Professor of Ophthalmology, Institute of Ophthalmology and Visual Science, New Jersey Medical School – UMDNJ, Newark, New Jersey, U.S.A.
Research Interests: Glaucoma diagnostic technologies, glaucoma pharmacology, intraocular pressure.
Leadership Positions: New Jersey Glaucoma Society – Founder, American Glaucoma Society – Executive Committee, American Society of Cataract & Refractive Surgeons – Glaucoma Clinical Committee, ARVO – Committee Chair, Association of International Glaucoma Societies – Steering Committee.

Murray Fingeret, OD

Title and Affiliation: Chief, Optometry Section, Dept Veterans Affairs, New York Harbor Healthcare System, Brooklyn, NY, Professor, State University of New York, College of Optometry
Research Interest: Perimetry, New Technologies and Imaging
Leadership Positions: President, Optometric Glaucoma Society; Chair Glaucoma Diplomat Program, American Academy of Optometry;Chair, Glaucoma Committee, American Optometric Association, Board Member The Glaucoma Foundation.

Josef Flammer, MD

Title and Affiliation: Professor and Head, Department of Ophthalmology, University Basel, Basel, Switzerland.
Research Interests: Blood flow. Systemic risk factors.
Leadership Positions: Dean, Faculty of Medicine, Basel (1995-1996).
Special Awards: Montgomery Award (2001); William MacKenzie Award (2002); Poster Award SOG (2002); Invited Professor University of Varna, Bulgaria (2003); Honorary Member of Czech Glaucoma Society and Invited Professor (2003); Honorary Guest Meeting of the Nobel Prize Laureate (2003); Invited Professor Dalhousie University (2004); Medal of the University of Helsinki (2004).

John Gerard Flanagan

Title and Affiliation: Professor, School of Optometry, University of Waterloo, Professor, Department of Ophthalmology and Vision Sciences, Faculty of Medicine, University of Toronto.
Research Interests: Glaucoma: Pathophysiology of glaucoma. Cell culture model of glaucoma, capable of manipulating biomechanical stretch and ischemia. Biomechanics of the lamina cribrosa of the optic nerve. Ocular hemodynamics. Clinical psychophysics and imaging. Aspects of spatial and temporal vision processing. Structure/Function relationships. Sleep. Diurnal variation in ONH topography, IOP, blood pressure and ocular perfusion. Diabetic Eye Disease: Particular interest in diabetic macular edema and its natural history. Ocular hemodynamics in diabetes. Clinical psychophysics and imaging.
Special Honours: Recipient of the Glenn A. Fry Award. American Optometric Foundation, distinguished Scientist or Clinician for his or her current research contributions (2004). Research Award for Top Ranked Grant Application. Glaucoma Research Society of Canada (2004). Plenary Lecturer, American Academy of Optometry (2003).

Brad Fortune

Title and Affiliation: Associate Scientist, Discoveries in Sight/Devers Eye Institute, Portland, OR; Clinical Instructor, Dept. of Ophthalmology, School of Medicine, Oregon Health Sciences University, Portland, OR; Director, Clinical Electrophysiology Service, Devers Eye Institute, Legacy Health Systems, Portland, OR; Associate Scientist, Legacy Health Systems, Portland, OR, U.S.A.
Research Interests: Visual Function
Special honors: Founding Member, Optometric Glaucoma Society (2002); Irvin and Beatrice Borish Award, American Academy of Optometry (2004).

Paul James Foster

Title and Affiliation: Clinical Senior Lecturer, Department of Epidemiology, Institute of Ophthalmology, University College London; Consultant Ophthalmologist, Glaucoma Service, Moorfields Eye Hospital, London; Research Fellow, Department of Ophthalmology, Norfolk and Norwich University Hospitals NHS Trust, Norwich, UK
Research Interests: Epidemiology of eye disease, especially angle-closure glaucoma and myopia. Population screening for angle-closure glaucoma. Clinical management of angle-closure and angle-closure glaucoma.
Special Honours: Singapore National Eye Centre Merit Award for Research (1997); Moorfields Eye Hospital Research Prize (2001).

David Steven Friedman

Title and Affiliation: Associate Professor, Wilmer Eye Institute, Johns Hopkins University School of Medicine; As-

sociate Professor, Department of International Health, Johns Hopkins Bloomberg; School of Public Health; Active Staff Appointments: Johns Hopkins Hospital, Johns Hopkins at Bayview.
Special honors: American Geriatrics Society Douglas Jahnigen Scholars Award (2002 – 2004); Research to Prevent Blindness Robert E. McCormick Award (2000).

Stefano Gandolfi, MD
Title and Affiliation: Professor of Ophthalmology and Chairman of the University Eye Clinic University of Parma, Parma, Italy
*Research Interest: G*laucoma pharmacology; evaluation of glaucoma surger(ies): non penetrating surgery, Express, trabecular stent etc.; pigmentary glaucoma; neuroprotection; health economics in glaucoma; contrast sensitivity in glaucoma.
Special honors:
EGS award for the best scientific contribution to the quadriennal Meeting in London 2000 and Florence 2004 EGS award for the 3rd scientific contribution to the quadriennal meeting, Paris 1996

David F. Garway-Heath
Title and Affiliations: Consultant Ophthalmologist and Clinical Research Lead - Glaucoma Research Unit, Moorfields Eye Hospital, London; Hon. Senior Research Fellow - Department of Visual Science, Institute of Ophthalmology, University College, London , United Kingdom
Research Interests: Research interests include optic nerve head and retinal imaging, measuring visual function, phenotyping, structure/function relationships, measuring disease progression, and determining risk factors for progression
Leadership positions: Glaucoma Society (UK & Eire) (Council member); Imaging Morphometry Association for Glaucoma in Europe (Secretary); International Glaucoma Association (Trustee); International Perimetric Society (Board member); Editorial Board Member: Eye and Current Eye Research

Doina Gherghel, MD, PhD
Title and Affiliation: Lecturer in Ophthalmology, Neuroscience Research Institute, School of Life and Health Sciences, Aston University, Birmingham, UK.
Research interests: Glaucoma. Ocular blood flow. Autonomic nervous system. Circadian rhythms. Chronotherapy. Oxidative stress *in vivo* and *in vitro* systems. Endothelial function. CAD and visual function.

Christopher A. Girkin, M.D., M.S.P.H.
Title and Affiliation: Associate Professor with Tenure, Director, Glaucoma Serive, UAB Department of Ophthalmology, 4th Floor Callahan Eye Foundation Hospital, Birmingham, AL, U.S.A.
Research Interests: Develop and evaluating composite measures that quantify glaucomatous damage based on optic disc topographic characteristics and measurements of nerve fiber layer integrity, along with specialized psychophysical and electrophysiologic measures in both African-Americans and Whites; Develop the first three-dimensional digital reconstructions of the human optic nerve head. These unique high-fidelity reconstructions can then be used to test hypothesis that variation in 3D laminar architecture are critical in determining individual susceptibility to glaucomatous injury. Specifically that variation in laminar 3D architecture are associated with well describe risk factors for glaucomatous disease such as increasing age and African-American ancestry.
Leadership Positions: Editorial Board, Glaucoma Today.

Ivan Goldberg
Title: Director
Affiliation: Eye Associates, and the Glaucoma Services, Sydney Eye Hospital
Research Interest: Clinical glaucoma – diagnosis and management
Leadership positions: President, SEAGIG (South East Asia Glaucoma Interest Group); Vice President, Glaucoma Australia; Past President, Royal Australian and New Zealand College of Ophthalmologists; Past Censor-in-Chief, Royal Australian and New Zealand College of Ophthalmologists; Past Chair, Board of Examiners, Royal Australian and New Zealand College of Ophthalmologists; Executive Committee Member, Asian Oceanic Glaucoma Society; Board of Governors' Member, Association of International Glaucoma Societies; Committee Member, Australian and New Zealand Glaucoma Club; Chair, Working Party, Asia Pacific Glaucoma Guidelines
Special Honours: Tow Prize, Prince Henry, Prince of Wales Hospitals, University of New South Wales; Silver Cockerel Award, Royal Australian and New Zealand College of Ophthalmologists; Hollows Lecture, Royal Australian and New Zealand College of Ophthalmologists.

Stuart L. Graham MBBS, MS, FRANZCO, FRACS
Affiliation: Save Sight Institute, Sydney, Australia
*Research Interest: G*laucoma and electrophysiology. Developed the AccuMap Objective Perimeter with Dr Klistorner

David S. Greenfield, M.D.
Affiliation: Bascom Palmer Eye Institute, University of Miami Miller School of Medicine, Miami, Florida, U.S.A.
Research Interests: Optic disc and retinal nerve fiber imaging, bleb-related ocular infection, normal-tension
glaucoma, and complex glaucoma filtration surgery.
Leadership Positions: Co-founder and secretary-treasurer of the International Society for Imaging in the Eye (ISIE), member of the editorial board

of *Ophthalmic Surgery Lasers and Imaging*, member of multiple professional societies, scientific reviewer for 10 peer-reviewed publications, Glaucoma Program Committee/Eye Care
America.
Special Honors: Awarded the 2003 American Academy of Ophthalmology Achievement Award, National Institutes of Health grants RO1 EY013516 and EY08684.

Franz Grehn, M.D.

Title and Affiliation: Chairman of the Department of Ophthalmology, Josef-Schneider-Str. 11, 97080 Würzburg, Germany.
Research Interests: Basic and clinical research in glaucoma, microsurgery. Laboratory for cell biology in glaucoma research. Prospective Randomized Clinical Studies.
Leadership Positions: Member of the Executive Committee of the Eruopean Glaucoma Society; President of the German Society of Ophthalmology (2002-2003); Member of the Executive board of the Glaucoma Society of the International Congress of Ophthalmology (2003); Honorary Member of the Romanian Academy of Medical Sciences (2005).

Erik L. Greve, MD, PhD

Title and Affiliation: Professor, Executive Vice President AIGS, Chief and Managing Editor International Glaucoma Review, former head Glaucoma Department University of Amsterdam, etc.
Areas of Interest: Progression, Angle Closure Glaucoma, Normal Pressure Glaucoma.
Leadership positions: Executive Vice President AIGS, Chief and Managing Editor International Glaucoma Review; Past President and co-founder of the EGS; Past Vice President of the Organization Committee of the ICO; Past Vice President of the Netherlands Ophthalmological Society; Past General Secretary and co-founder of the IPS; Past President and founder of the Netherlands Foundation for the Blind and Visually Handicapped Founder International Glaucoma Review, etc.
Special Honors: Knight in the Order of the Netherlands Lion; Guest of Honor lectures at numerous occasions Honorary Member of the IPS.

Ronald L. Gross, M.D.

Title and Affiliation: Professor of Ophthalmology, *The Clifton R. McMichael Chair in Ophthalmology,* Baylor College of Medicine Houston, Texas, U.S.A.
Research interests: Collaborative Initial Glaucoma Treatment Study. Ocular Hypertension Treatment Study. Components in Tissue Scarring
Leadership Positions: Chairman of the Executive Committee for the Baylor Eye Physicians and Surgeons
Special honors: American Academy of Ophthalmology 2004 Senior Achievement Award.

Franz H. Grus PhD MD
Title and Affiliation: Dept. of Ophthalmology, Universitäts-Augenklinik, Langenbeckstr. 1, 55101 Mainz, Germany
Head of the Experimental Ophthalmology unit: 'Ocular proteomics and Immunology of the Eye'.

Research Interests: Glaucoma: changes in natural autoimmunity in glaucoma patients; Tear film: Biomarkers for non-invasive diagnostics and therapeutics; Ocular Proteomics: ProteinChips and Arrays, Mass-spectrometry, conventional Proteomics; Ocular Immunology; Computer Sciences: Pattern matching algorithms for diagnostics purposes; Development of specialized software modules

Alon Harris
Title and Affiliation: Letzter Endowed Professor of Ophthalmology, Professor of Physiology and Biophysics, Department of Ophthalmology, Indiana University School of Medicine
Research Interests: **Clinical.** Ocular blood flow changes in glaucoma and its relationship to optic nerve topography, nerve fiber layer changes, and visual function; Vascular mechanisms involved in normal tension glaucoma, primary open-angle glaucoma, and retinal vascular diseases; Pharmacological treatment of glaucoma with an emphasis on vascular and metabolic effects; Development of new pharmacological agents for the treatment and reversal of vascular abnormalities in eye disease. **Basic.** Biochemical factors involved in the regulation of ocular circulation; Development and use of non-invasive imaging technologies for assessment of ocular blood flow, oxygen saturation and metabolism; Pharmacologic vasoprotection and neuroprotection of the optic nerve head and retina; Relationship between changes in perfusion pressure, blood pressure and intraocular pressure on ocular hemodynamics; development of vasoactive medication.
Leadership positions: Director, Glaucoma Research and Diagnostic Laboratories, Department of Ophthalmology, Indiana University School of Medicine; Co-Director, Age Related Macular Degeneration Clinical and Research Center, Department of Ophthalmology, Indiana University School of Medicine.
Special honors: Edmund Benjamin Spaeth Oration Award for Outstanding Clinical Research (1995); Research to Prevent Blindness, William and Mary Greve International Research Scholar Award (1995); Awarded Letzter Endowed Professor of Ophthalmology (1999); Alliance of Distinguished and Titled Professors, Indiana University (2000).

Ronald S. Harwerth, OD, PhD

Title: John and Rebecca Moores Professor of Optometry
Affiliation: College of Optometry, University of Houston, Houston, TX 77204-2020
Research interest: Structure-function relationships in glaucoma, perimetry, experimental glaucoma in monkeys, animal psychophysics,
Leadership positions: Chair of the Department of Vision Sciences, College of Optometry
Special honors: Doctor of Science (honorary), State University of New York (2000); Alumnus of the Year, University of Houston, College of Optometry (2000); International Glaucoma Research Award (2000); Member, Board of the International Perimetry Society (2002); UHCO Outstanding Graduate Faculty Award (2003).

Mingguang He, MD MPH
Title and Affiliation: Associate Director / Associate Professor, Department of Preventive Ophthalmology,
Zhongshan Ophthalmic Center; Country Director, Helen Keller International, New York.
Research Interests: Cross-sectional research of glaucoma,

myopia in Chinese; Anterior segment and iris dynamics in the mechanism of angle closure; Natural history of angle closure glaucoma; Evidence-based assessment of the intervention in angle closure glaucoma; Genetic epidemiology of juvenile myopia in Chinese
Leadership position: Vice-chairman, Panel of Prevention of Blindness (National), Chinese Ophthalmological Society.

Special Honors: Graduate Research Scholarship, University College London (2002).

Paul Raymond Healey, B.Med.Sc. (Cell Biology), M.B.B.S. (Hons), M.Med. (Clin. Epi.), F.R.A.N.Z.C.O.

Affiliation: Department of Ophthalmology, University of Sydney, Centre for Vision Research & Western Sydney Eye Hospital, Westmead Hospital, Westmead, NSW 2145, Australia; Eye Associates, Level 4, 187 Macquarie St.
Sydney NSW 2000, Australia; Clinical Senior Lecturer: University of Sydney, Department of Ophthalmology, Save Sight Institute & Westmead Millennium Institute; Director of Glaucoma Services, Western Sydney Eye Hospital, NSW; Visiting Medical Officer in Ophthalmology: Westmead Hospital ,Sydney/ Sydney Eye Hospital (Assoc), Auburn Hospital, Blacktown-Mt Druitt Hospitals; Director of Glaucoma Research, Centre for Vision Research, Westmead Millennium Institute, Department of Ophthalmology, University of Sydney; Chief Glaucoma Investigator: Blue Mountains Eye Study.
Research Interest: Principal Research Interests; Glaucoma; Ophthalmic Epidemiology & Public Health; Genetic Epidemiology; Cell Biology of ophthalmic diseases; Diagnostic Test & Screening Evaluation; Glaucoma Surgery Research
Special Honors: Association of International Glaucoma Societies – AIGS Award for best paper of 2003 (Prof P Mitchell senior author and recipient 2004).

Anders Heijl

Title and Affiliation: Professor and Head at the Department of Ophthalmology, Malmö University Hospital, University of Lund, Sweden.
Research Interests: Diagnostics, epidemiology and treatment effects
Leadership Positions: President of the International Glaucoma Society of the ICO; Study Director and PI: The Early Manifest Glaucoma Trial (NIH, MFR); Main ophthalmology advisor (Vetenskapligt Råd) for the Swedish National Board of Health and Welfare; Chairman EBM project Open Angle Glaucoma, The Swedish Council on Technology Assessment in Health Care; Chief Editor Acta Ophthalmologica Scandinavica.
Special Honors: The AIGS Award 2003 (Association of International Glaucoma Societies) for best glaucoma paper world wide 2002; The KKK Lundsgaard medal of the Nordic Ophthalmological Societies for best scientific paper in Acta Ophthalmologica 2002-2003.

D. Heuer

Dr. Heuer received his undergraduate and medical degrees from Northwestern University. He completed his ophthalmology residency at the Medical College of Wisconsin and a two-year National Research Service Award-funded glaucoma fellowship at the Bascom Palmer Eye Institute. Dr. Heuer has published extensively on the use of conventional filtering procedures with wound-healing modulation and aqueous shunting procedures for the management of glaucomas with poor surgical prognoses. He has participated in several glaucoma clinical trials, including the Fluorouracil Filtering Surgery Study, Collaborative Normal-Tension Glaucoma Study, and Collaborative Initial Glaucoma Study. Dr. Heuer currently serves as one of the three Vice Chairs of the National Eye Institute-sponsored Ocular Hypertension Treatment Study. He is Professor and Chairman of Ophthalmology at the Medical College of Wisconsin, where he also serves as the Director of the Froedtert & Medical College Eye Institute.

Roger Hitchings

Title: IGA Professor of Ophthalmology, University of London
Affiliation: Moorfields Eye Hospital London
Research interest: The process of research, the health economics of glaucoma, normal pressure glaucoma
Leadership position: Senior Specialist Glaucoma Service, Moorfields Eye Hospital; Director of Research & Development Department, Moorfields Eye Hospital; President European Glaucoma Association.
Special Honours: Duke-Elder Lecturer, Royal College of Ophthalmologists; Shaffer lecturer American Academy of Ophthalmology.

Gábor Holló, M.D., PhD, DSci

Affiliation: Director, Glaucoma Service and Perimetry Unit, Department of Ophthalmology, Semmeleweis University; President, Glaucoma Section of the Hungarian Ophthalmological Society.
Research interest: Glaucoma (basic science, experimental and clinical research) with special emphasises on imaging, IOP measurement, exfoliation syndrome, blood flow research, medical and laser therapy of glaucoma and wound healing.
Special honours: Jendrassik Medal (2000), Gedeon Richter award (1998), Excellent Tutor in Medical Research (2002).

Anton Bernhard Hommer, M.D.

Affiliation: Oberarzt der Augenabteilung, Krankenanstalt " Sanatorium Hera", Lustkandlgasse 24; A-1090 Vienna Austria;
Research interest: Glaucoma, clinical trials
Leadership Positions: President of the Viennese Ophthalmological Society Februar 2004 till January 2005 Secretary of the Glaucoma Section of the Austrian Ophthalmological Society since 2001

Megumi Honjo, MD., PhD.

Affiliation: Department of Ophthalmology, Kitano Hospital, Osaka 530-8480, Japan
*Research interest: A*queous outflow, neuroprotection, cell adhesion.
Leadership positions: Assistant director, Ophthalmology, Kitano Hospital.
Special honors: Suda Glaucoma Research Foundation Research Award (2003); Imai Research Foundation
Research Award (2003); JSPS Research Fellowships for Young Scientist Scholarship (1998).

Michele M. Iester, MD

Title and Affiliation: Contract Professor in ONH Imaging and Neuro-Ophthalmology, University Eye Clinic of Genoa, Italy.
Research interest: Glaucoma, ONH imaging, Visual field (white/white and unconventional)
Special Honors: The Italian selection to participate to the European Chibret Award (2000); Premium of the Italian Ophthalmological Society for the best semeiological work about FDT (2000); Premium of the Italian Ophthalmological Society for the best semeiological work about retinal nerve fiber layer measurements (2001).

Kyoko Ishida M.D.,Ph.D.

Title and Affliation: Assistant professor, Gifu University Graduate School of Medicine, Gifu, Japan

Mohamad Sami Jaafar, MD, FACS, FAAP

Title and Affiliation: Professor of Ophthalmology and Pediatrics, George Washington University
Chairman, Department of Ophthalmology, Children's National Medical Center, Washington, DC; Director, Pediatric Ophthalmology & Strabismus Fellowship Training Program, Children's National Medical Center, Washington, DC, U.S.A.
Research Interests: Infantile Glaucoma. Tonometry in Infants and Children. Amblyopia. Infantile Esotropia. Restrictive Strabismus. Retinopathy of Prematurity.
Leadership Positions: Member, Training and Accreditation Committee, American Association for Pediatric Ophthalmology and Strabismus; Member, Membership and Credentials Committee, American Association for Pediatric Ophthalmology and Strabismus.
Special Honors: Sauber Excellence in Medicine Award, Washington, DC, February 5, 2005.

Chris A. Johnson, Ph.D.

Title and Affiliation: Oregon Lions' Anderson, Chenoweth, Ross Vision Research Chair; Director of Diagnostic Research & Senior Scientist, Devers Eye Institute & Discoveries in Sight Research Labs 1040 NW 22nd Avenue, Suite 200, Portland, OR, U.S.A.

Research Interests: Perimetry, visual field testing and psychophysical evaluation of glaucoma and retinal diseases. Development of automated diagnostic test procedures. Imaging and topography of the optic nerve head and retinal nerve fiber layer. Visual factors related to task performance in transportation/aviation and industry. Motion and flicker perception.
Special Honors: 1987 Distinguished Service Award, American Academy of Ophthalmology (1987). Honor Award, American Academy of Ophthalmology (1988). Research to Prevent Blindness Senior Scientific Investigator Award (1992). Glenn Fry Award, American Optometric Foundation (1994). Peters Memorial Lecturer, UC Berkeley Optometry Alumni Association (1999). American Glaucoma Society Lecturer (2004). Invited Speaker, Japanese Ophthalmological Society (Tokyo) (2004).
Leadership Positions: Member, Glaucoma Advisory Committee, Prevent Blindness America (January 1994 - 2004). Member, Scientific Advisory Board, The Glaucoma Foundation, New York (1997-present). Vice President, International Perimetric Society, (June 2004 – present)

Jost B. Jonas, M.D.

Title and Affiliation: Professor, Department of Ophthalmology, Faculty of Clinical Medicine Mannheim of the Ruprecht-Karls-University Heidelberg, Germany
Research interest: Intravitreal application of medication as treatmentof intraocular edematous, proliferative and neovascular diseases; Femtosecond laser surgery of the cornea; Contact lens associated ophthalmodynamometry; Accommodative cataract surgery; Near-Infraed inferometry for diagnosis of ocular diseases; Retinal stem cell research; Morphologic diagnosis of optic nerve diseases including the glaucomas
Leadership positions: Professor of Ophthalmology and Chairman

Kenji Kashiwagi, M.D.

Research interest: Clinical investigations: Screening system for angle closure glaucoma. On line supporting system for glaucoma treatment. Pharmacology of anti-glaucoma drugs; Basic science: Pharmacology of anti-glaucoma drugs. Retinal ganglion cell protection.
Special honors: Suda award (Japan Glaucoma Society); Rohto award (Rohto pharmaceutical company)
Leadership positions: Councilor of Japan Glaucoma Society; Councilor of Japanese Ophthalmological Society; Councilor of Japanese Society for Ocular Pharmacology

L. Jay Katz MD, FACS

Title and Affiliation: Professor, Jefferson Medical College, Attending Surgeon and Co-Director, Glaucoma
Wills Eye Hospital, Philadelphia, Pennsylvania, U.S.A.
Research Interest: Dr. Katz has current and past projects include being a participant in the NEI/NIH Glaucoma Laser Trial, the Advanced Glaucoma Intervention Study,

and the Collaborative Initial Glaucoma Treatment Study. *Special Honors:* American Academy of Ophthalmology's Senior Achievement Award (2002); Joint Commission on Allied Health Personnel in Ophthalmology's Faculty Award (2003); Distinguished Alumnus of the Yale University Eye Center (2003).

Paul L. Kaufman, MD/ PhD (HC)

Title and Affiliation: Professor and Chair of the Department of Ophthalmology & Visual Sciences at the University of Wisconsin Medical School, Madison, Wisconsin; Peter Duehr Professor and Chairman, U.S.A.
Research Interests: Dr. Kaufman is a physician-scientist, specializing in glaucoma and studying the mechanisms of aqueous humor formation and drainage, and the age-related loss of near vision (presbyopia).
Leadership Positions: Dr. Kaufman is the Past President and current Executive Vice President of the Association for Research in Vision and Ophthalmology, and Past President of the International Society for Eye Research. He has served on the US National Advisory Eye Council and numerous foundation and corporate scientific advisory boards. He has served as a reviewer for all the major eye journals and guest editor or editorial board member for many of them. He has had continuous research funding from the US National Eye Institute for 25 years, has authored nearly 300 original scientific articles and 50 book chapters, co-edited several textbooks including the most recent edition of Adler's Physiology of the Eye (Kaufman PL, Alm A, eds. Adler's Physiology of the Eye, Tenth Edition. St. Louis: Mosby, 2002)
Distinguished Lectures: Presentation at combined AAO and Prevent Blindness America Symposium "Glaucoma Management 2002: Medical and Surgical State of the Art": The Robert N. Shaffer Lecture: Medical therapy of glaucoma: Where are we going, when will we get there? American Academy of Ophthalmology/Pan-American Association of Ophthalmology 2002 Joint Meeting, Orlando, FL, October 19-23, 2002.
Special Honors: Doctor Honoris Causa, Medical Faculty, University of Uppsala, Uppsala, Sweden (2003); Association of International Glaucoma Societies Award (formerly International Glaucoma Reviews Award) for best glaucoma paper of 2003 (#261: Gabelt BT, Gottanka J, Lütjen-Drecoll E, Kaufman PL: Aqueous humor dynamics and trabecular meshwork and anterior ciliary muscle morphologic changes with age in rhesus monkeys. Invest Ophthalmol Vis Sci 44:2118-2125, 2003.)

Peng Tee Khaw, PhD FRCS FRCOphth FRCP FIBiol FRCPath FMedSci

Title: Professor of Glaucoma and Ocular Healing and Consultant Ophthalmic Surgeon
Affiliation: Moorfields Eye Hospital and Institute of Ophthalmology, University College London.
Research Interest: Wound healing, tissue repair and regeneration, stem cells, glaucoma surgery techniques, clinical trials.
Leadership Positions: Head, Ocular Repair and Regeneration Unit and Paediatric Glaucoma Service Moorfields Eye Hospital.
Special honours: Chairman ARVO Programme Committee, First ARVO/Pfizer Translational Research Award (2005); 25th Dame Ida Mann Lecture (2004); Alcon Research Award for Scientific Excellence. 12th Sir Stewart Duke Elder Lecture(2003); Elected to British Academy of Medical Sciences (2002); Hunterian Professorship, Royal College of Surgeons. IGR Award for Best Research Paper (1999).

Yoshiaki Kitazawa, M.D., Ph.D

Title and Affiliation: Director, Akasaka Kitazawa Eye Clinic, Tokyo, Japan, Professor Emeritus, Gifu University, Gifu, Japan.
Research Interest: Glaucoma
Leadership Positions: International Glaucoma Society of International Congress of Ophthalmology (IGSICO), President (1994-98); International Perimetric Society (IPS), Vice President (1994-2002); Asia Oceanic Glaucoma Society (AOGS), President (1997-); Japan Glaucoma Society, President (1998-).
Special Honors: Bartisch Award & Lecture (University of Dresden); Goldmann Award & Lecture (IGSICO).

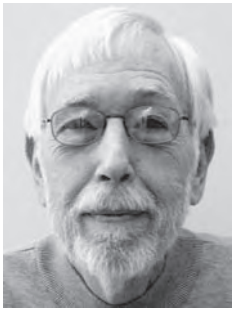
Christoph Kniestedt, MD

Affiliation: Kantonsspital Winterthur, Augenklinik, Brauerstr. 15, CH-8400 Winterthur, Switzerland.

Anastasios G. P. Konstas, MD, PhD

Title and Affiliation: Associate Professor in Ophthalmology, Head, Glaucoma Unit, A University Dept. of Ophthalmology, AHEPA Hospital, 1 St Kyriakidi Str, Thessaloniki 546 36, Greece.
Research Interests: Exfoliation and primary-open angle glaucoma. 24-hour IOP response of all new medications in glaucoma. Relationship between systemic disorders. Compliance in medical therapy.
Leadership positions: Board member of the Greek Glaucoma Society (2001); Vice President of the Panhellenic Ophthalmological Society (2003).

Theodore Krupin, MD



Title and Affiliation: Clinical Professor of Ophthalmology, Feinberg School of Medicine, Northwestern University,
Chicago, IL, U.S.A.
Research Interest: Current research interests include coordination of a multicenter study of low pressure glaucoma and clinical outcomes of glaucoma surgical therapies.
Leadership Positions: Association for Research in Vision and Ophthalmology (ARVO) Awards Committee (Glaucoma Section representative) (2003).
Special Honors: American Glaucoma Society Presidents Award (2004); 12th Annual Arthur Light, M.D. Lectureship in Ophthalmology, Stritch School of Medicine, Loyola University Chicago (2004).

Yasuaki Kuwayama, MD, PhD

Title and affiliation: Director of Ophthalmology, Osaka Koseinenkin Hospital, Japan; Clinical Professor of Ophthalmology, Osaka University Medical School, Japan.
Research interest: Circadian regulation of IOP, surgical outcomes.
Leadership positions: Executive Director, Japan Glaucoma Society; Councilor, Japanese Ophthalmological Society; Councilor, Japanese Society for Ocular Pharmacology.
Special honors: Suda Memorial Award, Japanese Glaucoma Society.

Yves Lachkar

*Title and Affiliation: H*ead of department of Ophthalmology, Saint-Joseph Foundation Hospital and the director of the Institute of Glaucoma in Paris.
Research Interests: Non penetrating surgery and wound healing.
*Leadership Positions: M*ember of the editor's board of the Journal of Glaucoma. Member of the Executive Committee and the Scientific Committee of the European Glaucoma Society (EGS), co author of the EGS Guidelines 1998 and 2003 and is a member of the College of Medicine of Paris Hospitals.

Dr. Dennis Shun-chiu Lam M.B.,B.S. (HKU); M.D. (CUHK); D.O. (IRELAND); D.O. (GLASGOW); F.R.C.S. (EDINBURGH); F.R.C. Ophth (UNITED KINGDOM); F.R.C. Ophth (HONG KONG); F.H.K.A.M. (Ophthalmology)

Title and Affiliation: Chairman of the Department of Ophthalmology & Visual Sciences and Associate Dean (External Affairs) of the Faculty of Medicine.
Research Interests: 1. Angle-closure glaucoma; 2. Myopia (from epidemiology to molecular genetics); 3. Ocular epidemiology; 4. Macular diseases and surgeries: diabetic macular edema, macular hole and epiretinal membrane; 5. Cataract and refractive surgeries; and 6. Applying nano technology and traditional Chinese medicine to ophthalmology.
Leadership Positions: Founder of the Hong Kong Journal of Ophthalmology in 1995. Secretary-General of the Asia-Pacific Academy of Ophthalmology, the President of the College of Ophthalmologists of Hong Kong, and the President of the World Ophthalmology Congress to be held in Hong Kong in 2008.
Special Honors: American Academy of Ophthalmology Achievement Award (2000); APAO Distinguished Service Award(2001). Appointed as 'Justice of the Peace' (2004).

Paul P. Lee

Affiliation: James Pitzer Gills III MD and Joy Gills Professor of Ophthalmology, Duke University, Durham, North Carolina; Professor, Department of Ophthalmology, Duke University, Durham, North Carolina, U.S.A.
Research Interest: Quality of Care, Patient-Cenetered Care, Health Care Utilization and Policy, Glaucoma Surgery.
Special Honors: Senior Fellow, Duke Center for Clinical Health Policy Research.

Hans G. Lemij, MD, PhD

Affiliation: Rotterdam Eye Hospital, Totterdam, The Netherlands.
Research Interest: Glaucoma, notably imaging, perimetry and genetic epidemiology.
He took the lead in establishing the Imaging and Morphometry Association for Glaucoma in Europe (IMAGE). Several research fellows have graduated as a PhD under his supervision. He also chairs the Dutch Glaucoma Group.

Leonard A. Levin, M.D., Ph.D.

Title and Affiliation: Associate Professor in the Departments of Ophthalmology and Visual Sciences, Neurology, and Neurological Surgery at the University of Wisconsin Medical School, Madison, Wisconsin,U.S.A.
Research Interests: Clinical: Diseases of the optic nerve. Research on the mechanisms of retinal ganglion cell death at the molecular, tissue culture, and whole animal level. Focus is on the role axonal damage plays in inducing loss of retinal ganglion cells (an area common to both neuro-ophthalmology and glaucoma).
Leadership Positions: Associate Editor Archives of Ophthalmology; Section Editor for Mechanisms of Ophthalmic Disease.
Special Honors: Dolly Green Special Scholarship from Research to Prevent Blindness and the Marjorie W. Margolin and Sam and Bertha Brochstein prizes from the Retina Research Foundation.

Richard A. Lewis, MD

Title and Affiliation: Diplomate of the American Board of Ophthalmology and the National Board of Medical Examiners. Former Director of Glaucoma for the University of California, Davis.
Research Interest: Glaucoma.
Leadership Positions: Editorial board for Focus on Glaucoma and Journal of Glaucoma. Section Editor for Ocular Surgery News. As a representative of the American Academy of Ophthalmology he is a member of the Subspecialty Day Committee and serves as Glaucoma Liaison. He is also a member of the Glaucoma Clinical Committee of the American Society of Cataract and Refractive Surgery and a member of the Steering Committee for the Association of International Glaucoma Societies. Past President of the American Glaucoma Society.
Special Honors: Heed Fellowship and the American Academy of Ophthalmology Senior Honor Award.

Jeffrey M. Liebmann, MD

Title and Affiliation: Clinical Professor of Ophthalmology, New York University School of Medicine
Director, Glaucoma Services, Manhattan Eye, Ear and Throat Hospital and New York University Medical Center, New York, New York, U.S.A.
Research Interest: Investigations into the causes of glaucoma, ocular imaging, and neuroprotection.

Leadership Positions: Secretary-Treasurer of the New York Glaucoma Society; Past-President of the New York
Society for Clinical Ophthalmology; Co-founder of the New York Glaucoma Research Institute.

James D. Lindsey, Ph.D.
Title and Affiliation: Associate Adjunct Professor, Hamilton Glaucoma Center and Department of Ophthalmology
School of Medicine, University of California San Diego, La Jolla, CA, U.S.A.
Research Interests: Interests include cell biology issues contributing to the development of glaucoma, that clarify the damage that occurs in glaucoma, and that underlie interventions to arrest and reverse glaucoma. Recent investigations have used various glaucoma models to clarify the molecular basis of retinal ganglion cell survival, uveoscleral outflow, iris pigmentation, and optic nerve damage.

Brian Little, FRCS FRCOphth
Affiliation: Royal Free Hospital, London, UK
Research Interest: Surgical techniques & instrumentation, postgraduate training.
Leadership Position: UKISCRS Council, Microsurgical Training Committee RCOphth.
Special Honour: UK Ambassador to ORBIS international eye charity.

Elke Lütjen-Drecoll, M.D.
Title: Professor
Affiliation: Full professor and head of the Department of Anatomy II, University of Erlangen/Nuernberg, Germany
Research Interest: Functional morphology of the eye; Glaucoma; Immune Priviledge
Leadership Positions: Member of the Academy of Science and Literature, Mainz (1991); Vice-president of the Academy of Science and Literature, Mainz (1997); President of the Academy of Science and Literature, Mainz, Germany (2005).
Special Honors: 2004 Award of the International Glaucoma Symposium (AIGS) in Florenz (2004);
Bárány-Award, awarded at the ICER-meeting in Sidney(2004); Ever-Award, awarded at the EVER-meeting in Alicante/Spain (2004).

Giorgio Marchini,
Title and Affiliation: Professor, Head director of the Ophtalmic Clinic, Verona University, Department of Neurological and Visual Science, Verona, Italy.
Research Interest: Glaucoma, ultrasound biomicroscopy, anterior segment surgery, corneal transplantation and ocular tumors.
CUR

Dr Silvio Paolo Mariotti Ph.D.
Title: Medical Officer, Ophthalmologist.
Affiliation: World Health Organization, Geneva, Prevention of Blindness and Deafness.
Research Interest: Epidemiology, Applied Reasearch, Control strategies particularly in Trachoma, Glaucoma, ARMD, Diabetic Retinopathy.
Leadership Positions: in charge of WHO Global Database on Blindness, publication of global data on visual impairments, development of models and estimates for data on V.I., Global Elimination of Trachoma coordination, Glaucoma control activities.
Special Honors: IOAT Gold Medal (2003); Italian Ophthalmological Society, G.B. Bietti Award 2000.

Keith RG Martin, MA DM MRCP FRCOphth
Title: University Lecturer and Consultant in Ophthalmology
Affiliation: Cambridge University Centre for Brain Repair, Cambridge; Eye Department, Addenbrooke's Hospital, Cambridge, UK.
Research Interest: Research work is focused on the mechanisms of visual loss in glaucoma and the development of new treatment approaches; Currently developing gene therapy and stem cell techniques to try to prevent visual loss due to glaucoma and ultimately to restore vision in those blind due to the disease.
Leadership positions: AIGS Junior Advisory Group member; • Group Leader at the Cambridge University Centre for Brain Repair.
Special Honors: American Glaucoma Fellows Award Program Merit Award (for Best Research by a Glaucoma Fellow in the USA, 2002); Awarded Doctor of Medicine degree by Oxford University in 2004 for glaucoma research; GSK Clinician Scientist Fellowship, 2005 – 2010.

Felipe Medeiros, M.D.
Title and Affiliation: Assistant Clinical Professor at the Hamilton Glaucoma Center, University of California San Diego, La Jolla, CA, U.S.A.
Research interests: Imaging of the optic disc and retinal nerve fiber layer, development of new methods for early detection of glaucoma, and elucidation of potential risk factors for development and progression of glaucoma.
Leadership Positions: Associate member of the Advisory Board of the Association of International Glaucoma Societies (AIGS); member of the Latin American Glaucoma Society and Association for Research in Vision and Ophthalmology (ARVO).

André Mermoud
Title and Affiliation: Head of Glaucoma Unit of the Jules Gonin Eye Hospital, Lausanne, Switzerland, University of Lausanne, Switzerland.
Research interest: Glaucoma surgery, structure of Schlemm's canal.

Leadership positions: Innovator in a new type of glaucoma surgery
Special honors: Medal of the Egyptian Society of Ophthalmology, Cairo (2001); Ophthalmologist of the Millennium. International Academy for Advances in Ophthalmology. Bombay (2002); Achievement Award, American Academy of Ophthalmology (2004).

Georg Michelson, M.D.
Title and Affiliation: Extraordinary Professor, Head of Outpatient Department, Department of Ophthalmology, University of Erlangen-Nuremberg, Erlangen, Germany.
Research Interests: Automatic Glaucoma Screening; Ocular Circulation in Glaucoma; Telemedical Assessment of Retinal Images; Tele-education in Ophthalmology.

Clive Migdal, MD FRCS FRCOphth
Affiliation: Western Eye Hospital, London
Research Interest: Glaucoma therapeutics
Leadership Positions: Secretary, European Glaucoma Society; Co-Chairman, Meetings Committee, AIGS; Editorial Board, Journal of Glaucoma.
Special Honours: Gold Medal, International Congress of Ophthalmology (1990); Lewis Rudin Glaucoma Prize (1995); Trantas Gold Medal, Greek Glaucoma Society (2005).

Stefano Miglior, MD
Title and Affiliation: Professor of Ophthalmology, Department of Neurosciences, University of Milan Bicocca,
Head of the Department of Ophthalmology, Policlinico di Monza, Monza (MI), Italy.
Research Interest: Glaucoma (all areas); Imaging of the optic disc and RNFL; Visual field evaluation; Medical therapy of glaucoma; Clinical trials.
Leadership positions: Principal Investigator of the study: 'European Glaucoma Prevention Study'. Funded by the European Commission in the BIOMED 2 program and Merck; Co-Investigator of the study: 'EGPS-OHTS Collaborative Analysis'. Funded by the National Eye Institute; Member of the Scientific Board of the 'International Society of Imaging in the Eye (ISIE)'; Member of the Executive Committee of the 'Italian Association for the Study of Glaucoma (AISG)'; Member of the Executive Committee of the 'Ophthalmological Society of Lombardia (Italy)'.

Don S. Minckler, MD
Title: Professor of Ophthalmology – Emeritus Director of Glaucoma Services
Affiliation: Doheny Eye Institute & University of Southern California (Keck) School of Medicine Los Angeles, California

Research Interests: Ocular pathology; pathophysiology of aqueous shunts, glaucoma surgery
Leadership positions: Past president Glaucoma Society of International Congress of Ophthalmology; Past Editor-in-Chief Ophthalmology & Board of Trustees American Academy of Ophthalmology
Honors: American Ophthalmological Society; Director American Board of Ophthalmology

Stephen A. Obstbaum, M.D.
Title and Affiliation: Chairman, Department of Ophthalmology, Lenox Hill Hospital, Professor of Ophthalmology
NYU School of Medicine, New York, NY, U.S.A.
*Research Interests: C*ataract , glaucoma and ocular inflammation.
Leadership Positions: President of the American Academy (1997). President of the American Society of Cataract and Refractive Surgery (1987-89); President of the International Intraocular Implant Club (1990-94). Secretary (English language) of the Pan American Association of Ophthalmology. Editor Emeritus of the Journal of Cataract and Refractive Surgery, after more than 20 years as its editor (2201).

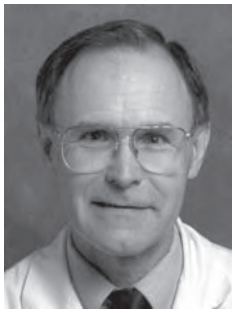
Orgül, Selim I.
Title and Affiliation: Professor, Chiefd, Department of Diagnostics and Research, University-Eye-Clinic, Mittlere Strasse 91, Postfach, 4012 Basel, Switzerland.
Leadership Positions: President, Group glaucoma of the Swiss Ophthalmic Society; Board member, European Association for Vison and Eye Research (EVER); President, Association for Continuing Education in Ophthalmology; Beditorial Board member, British Journal of Ophthalmology.

Neville N. Osborne
Title and Affiliation: Professor of Ocular Neurobiology at the Department of Ophthalmology in Oxford, UK.
Research Interests: Research aimed at understanding how cells in the retina die following defined insults and devising possible ways of preventing their death. The aim is to develop drug therapy to treat retinal degenerating diseases such as glaucoma and age-related macular degeneration.
Leadership Positions: Chief editor of Progress in Retinal and Eye Research. International Section Organiser for the Retinal Section, for the Geneva ICER meeting. Past Vice-President European Association for Vision and Eye Research.

Mona Pache, MD

Affiliation: University Eye Clinic Freiburg, Germany
Research interest: Glaucoma: Systemic findings in glaucoma patients, IOP measurement methods, pachymetry, ocular blood flow in glaucoma, new diagnostic tools in glaucoma.

Paul Palmberg, MD, PhD



Title: Professor of Ophthalmology.
Affiliation: Bascom Palmer Eye Institute, University of Miami, Miller School of Medicine, Miami, Florida, U.S.A.
Research Interest: Clinical trials in glaucoma, evidence-based target pressures, antimetabolite filtering surgery, techniques for managing post-operative complications of glaucoma surgery, natural history of diabetic retinopathy, corneal transplant tissue culture media.
Leadership positions: Past-president of the Pan-American Glaucoma Society.
Special honors: Co-recipient of the IGR Award (2000 publication) for the AGIS 7 paper; Co-recipient of the Banting and Best Award (American Diabetes Association) for the Diabetes Control and Complications Trial;
Shaffer Lecture, American Academy of Ophthalmology

Vincenzo Parisi, M.D.

Title and Affiliation: Head of the section Neurophysiology of Vision and Neurophthalmology, G.B. Bietti Foundation, Via Livenza 7, Rome; Professor, Neurophthalmology at the School of Specialisation in Neurology of the University of Rome 'La Sapienza'; Professor, School of Specialisation in Neurophysiopathology of the University of Rome 'Tor Vergata', Rome, Italy.
*Research Interests: C*linical and experimental research activities on the Neurophysiology of Vision (visual plasticity and neurosensorial mechanisms) and Neurophthalmology (glaucomatous, diabetic, and demyelinating neuropticopathies).

Richard Kenneth Parrish II

Title and Affiliation: Professor, Department of Ophthalmology, University of Miami School of Medicine, Miami, Florida, U.S.A.
Leadership Positions: Member of NEI Special Emphasis Panel (ZEY1-VSN-01)(2003);

Rodolfo A. Pérez Grossmann, MD
Title and Affiliation: Chairman of the "Instituto de Glaucoma y Catarata", Lima - Perú
Special Honors: Award for the research in Peruvian Ophthalmology: 'Searching the glaucoma gene';
Peruvian Congress of Ophthalmology (2002) Award for the research in Peruvian Ophthalmology: 'Anatomy of the Optic Tract'; Peruvian Congress of Ophthalmology (1994).

Norbert Pfeiffer, M.D.

Title and Affiliation: Professor, Head, Department of Ophthalmology
Research Interest: Glaucoma, Medical Therapy, Surgical Therapy, Diagnosis.

Lutz E. Pillunat, M.D., Ph.D.

Title and Affiliation: Professor, Chairman, Augenklinik und Poliklinik, Med izinische Fakultät Carl Gustav Carus, Dresden, Germany.
Leadership Positions: President of the Saxonian Ophthalmological Society. 1992 Honorary Membership of the Italian Glaucoma Society.

Bruce E. Prum, JR., M.D.

Title and Affiliation: Associate Professor of Ophthalmology, Department of Ophthalmology, University of Virginia, Charlottesville, Virginia, U.S.A.
Research Interests: Clinical trials of surgical management of glaucoma. Clinical trials of Latanaprost.
Leadership Positions: Member of the Glaucoma Panel for the Preferred Practice Patterns Committee of the American Academy of Ophthalmology, 2002-2005; Member of the Specialty Clinical Update Committee for Glaucoma of the American Academy of Ophthalmology, 2002-2005. Associate Examiner for the American Board of Ophthalmology, 2001-2005.
Special Honors: 'Most outstanding professor of the year' teaching Award, Department of Ophthalmology, University of Virginia (2004).

Harry A. Quigley, M.D.

Title and Affiliation: Director, Glaucoma Service, Director, Dana Center for Preventive Ophthalmology, Wilmer Institute, Johns Hopkins University, Wilmer 120, Johns Hopkins Hospital, Baltimore, Maryland, U.S.A.
Research Interest: Glaucoma
Special Honors: Senior Honor Award, American Academy of Ophthalmology (1997); International

Glaucoma Review Award, Best Paper of the Year (2000); L. Harrell Pierce Teaching Award, Wilmer Residents (2003. 2nd time); Friedenwald Award, Association for Research in Vision and Ophthalmology (2004); Doyne Medal, Oxford Ophthalmological Congress (2004); Friedenwald Award (2004).

Anthony D. Realini, MD

Title and Affiliation: Associate Professor of Ophthalmology, West Virginia University, Morgantown, WV, U.S.A.
Research Interests: Spontaneous IOP fluctuations; structural and functional optic nerve testing.
Leadership Positions: Departmental Clinical Research Committee, Chair (WVU) 2004-present
Special Honors: Frederick W. Stocker Prize for Research in Ophthalmology (1996).

Robert Ritch, M.D.

Title and Affiliation: Professor, Department of Ophthalmology, New York Eye & Ear Infirmary, New York, NY, U.S.A.
Research Interest: Glaucoma.
Leadership Positions: Board of Directors, The Glaucoma Foundation, New York, NY (1983 -); Board of Directors, South Eastern Nigeria Eye Care Outreach, College of Medical Sciences, University of Calabar, Calabar, Nigeria (1996 -); Board of Directors, New York Eye and Ear
Infirmary (2004 -); Man of the Year, The Glaucoma Foundation (2000); Jesse H. Neal Award for Editorial Achievement (2000).

Cynthia Roberts, Ph.D.

Title and Affiliation: Associate Professor of Ophthalmology, Biomedical Engineering and Surgery, Torrence A. Makley Research Professor in Ophthalmology, The Ohio State University, Columbus, Ohio, U.S.A.
Research Interests: Corneal topography and corneal biomechanical response to laser refractive surgery.
Leadership Positions: Panel member of the Ophthalmic Devices Panel of the FDA.

Prin RojanaPongpun, MD.

Title and Affiliation: Chief, Glaucoma Service & International Affairs, Department of Ophthalmology, Chulalongkorn University & Hospital; Queen Sirikit National Institute of Child Health, Ministry of Public Health; Bumrungrad International
Research interest: Medical therapy in glaucoma: clinical trials. Cataract & glaucoma: surgical management, drug delivery. Angle closure: epidemiology, diagnosis and imaging technique, treatment. Pediatric glaucoma: surgical management.
Leadership positions: Executive Committee, The South East Asia Glaucoma Interest Group (SEAGIG). Board member, Asia-Pacific Academy of Ophthalmology (APAO). Board member, Asia-Pacific Association of Cataract and Refractive Surgeons (APACRS). Executive Committee, The Asian Angle-Closure Glaucoma Club (AACGC). Deputy Scientific Chairman & Executive Committee, The Royal College of Ophthalmologist of Thailand. Deputy Editor, Asian Journal of Ophthalmology. Editorial Board, Annals of Ophthalmology. Editorial board, Ocular Surgery News Europe/Asia-Pacific Edition. Research Advisory Board, Faculty of Medicine, Chulalongkorn University. International Advisory Board, SERI-ARVO.
Special honors: First Place Winner, Film Festival Award, American Society of Cataract and Refractive Surgery (ASCRS); Honor Award, Thai Red Cross Society

Pamela Anne Sample, Ph.D.

Title and Affiliation: Professor, Director, Clinical Vision Research, Hamilton Glaucoma Center, Department of Ophthalmology, University of California at San Diego, La Jolla, California, U.S.A.
Research Interests: Improved diagnosis and management of glaucoma. Psychophysical assessment of specific retinal ganglion cell populations using visual function specific perimetry to determine ganglion cell susceptibility to glaucoma, rate of progression, and response to neuroprotective agents. Improved methods for visual field analysis and for separating true glaucomatous progression from change in visual function due to other factors such as variability. Application of machine learning classifiers in a multifactorial model for improved diagnosis and management of glaucoma. Understaning loss of visual function due to aging, gender, genetics, and socioeconomic and cultural factors.
Leadership Positions: Principal Investigator: Diagnostic Innovations in Glaucoma Study: Visual Function. Principal Investigator: African Americans with Glaucoma Study: Structure and Function. Director, Visual Function Research Laboratory, Department of Ophthalmology, UCSD. Director, Visual Field Assessment Center (VisFACT), a reading center. Chair, UCSD Committee on Preparatory Education, 2003/04.
Special Honors: Outstanding Undergraduate Mentor Teacher Award, Warren College (2002); Fred Kapetansky Lecturer: awarded by Midwest Glaucoma Society (2002); 1st Distinguished Faculty Lecturer, Department of Ophthalmology Resident's Day, UCSD (2004).

Ursula Schlötzer-Schrehardt, PhD

Affiliation: Department of Ophthalmology, University of Erlangen-Nürnberg, Erlangen, Germany.
Research interests: Pseudoexfoliation syndrome, glaucoma, ophthalmopathology, cornea, extracellular matrix.
Leadership positions: Associate professor, lecturer, and chief of research laboratory at the Department of Ophthalmology, University Erlangen-Nürnberg.
Special honors: 'Thiersch' prize of the Medical Faculty of the University Erlangen-Nürnberg for the best medical thesis in 1999 (2000); Poster prize of the Deutsche Ophthalmologische Gesellschaft (2003).

Michal Schwartz, Ph.D.
Affiliation: Professor, Department of Neurobiology, The Weizmann Institute of Science, Rehovot, Israel.
Leadership Positions: Elected Member of The Scientific Board of The International Society of Neuroimmunomodulation.
Special Honors: Career Woman of the year 2000, Israel; ARVO Award for outstanding research in the basic or

clinical sciences as applied to ophthalmology (Friedenwald Award) (2002); The International Glaucoma Review Award for daring, breakthrough, creative, original research in glaucoma (2002).

Tarek Shaarawy, MD
Title and Affiliation: Head of Glaucoma Department, in the University of Geneva, Switzerland.
Research Interests: New surgical techniques of glaucoma surgery.
Leadership Positions: Secretary General of the International Society of Glaucoma surgery.

Peter Shah, BSc(Hons) MB ChB FRCOphth
Title and Affiliation: Consultant Ophthalmic Surgeon, Birmingham and Midland Eye Hospital / Good Hope Hospital NHS Trust, Birmingham, U.K.
Research Interests: Complex glaucoma surgery, juvenile glaucoma, glaucoma in African-Caribbean eyes, anterior segment reconstructive surgery and trauma surgery.
*Leadership Positions: G*laucoma co-editor for 'Eye'.

Ramanjit Sihota MD, FRCS
Title and Affiliation: Head of the Glaucoma research facility and clinical services at Dr Rajendra Prasad center for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India.
Research Interests: Primary angle closure glaucoma, imaging, surgical techniques and drug therapy in glaucoma.
Leadership Positions: Member of the Ethics Committee at the All India Institute of Medical Sciences.
Special Honors: Dr. P. Siva Reddy Award for Ophthalmic Research (1998); D B Chandra Award for Glaucoma research (1999); AC Agarwal trophy (2004); Silver salver for a poster presentation at the European Glaucoma society meeting (2004).

Kuldev Singh, M.D., M.P.H.
Title and Affiliation: Professor of Ophthalmology, Director, Glaucoma Services, Department of Ophthalmology, Assistant Dean for Medical Student Advising, Stanford University School of Medicine, Stanford, California, U.S.A.
Research Interests: Glaucoma. Clinical Epidemiology. Economics of Health Care Delivery. Ophthalmology in the Developing World.
Leadership Positions:

Special Honors: Achievement Award: American Academy of Ophthalmology (1999); Most Outstanding Glaucoma Presentation, Royal Hawaiian Eye Meeting (2004).

Gregory L. Skuta, MD
Title: James P. Luton Clinical Professor
Affiliation: Dean A. McGee Eye Institute, University of Oklahoma Health Science Center, Oklahoma City, Oklahoma, U.S.A.
Research Interests: Wound healing in glaucoma filtering surgery. Participation in multicenter clinical and surgical trials.
Leadership Positions: President, American Glaucoma Society; Secretary for Ophthalmic Knowledge, American Academy of Ophthalmology; Director, American Board of Ophthalmology; Board of Governors, Association of International Glaucoma Societies; Editorial Board, Journal of Glaucoma.
Special Honors: Active Member, Glaucoma Society of the International Congress of Ophthalmology.

George L. Spaeth, M.D.
Title and Affiliation: Louis J. Esposito Research Professor, Director, Glaucoma Service, Wills Eye Hospital, Philadelphia, Pennsylvania, U.S.A.
Research Interest: Blood flow. Optic nerve. Quality of life.
Leadership Positions: E. B. Spaeth Clinical Research Foundation: Founder and President; Eye Disease Foundation: Founder and President; Wills Eye Hospital Glaucoma Service Foundation to Prevent Blindness: Founder and President
Special Honors: Selected as one of the *Best Ophthalmologists in America* by a survey of the Chairmen and Directors of Residency Training Programs in the United States (1999); American Academy of Ophthalmology, *Lifetime Achievement Award* (2000).

Robert L. Stamper, M.D.
Title: Professor and Director of the Glaucoma Service.
Affiliation: University of California, San Francisco (UCSF), San Francisco, California, U.S.A.
Research Interest: Early diagnosis, Surgical approaches, pharmacology of glaucoma.
Leadership positions: Editor, Ophthalmology Clinics of North America (1988-2004); President – American Glaucoma Society (1999-2000)
Special Honors: Distinguished Alumnus Lecture: Washington University School of Medicine (9/2004).

Remo Susanna Jr., MD
Title and Affiliation: Associated Professor in Ophthalmology,
Leadership Positions: President and founder of The Latin America Glaucoma Society; Member of the editorial board of: Journal of Glaucoma USA (1992-1995), British J. Ophthalmology, Rev. Brasileira de Oftalmologia, Arq.Brasileiro de oftalmologia; Moderator ARVO 1997-1998-2000-2001, 2003 and Moderator Subspecialty Day- American Academy of

Ophthalmology 1999-2000 and 2001, 2003; Member and governor of The Association of Glaucoma International Societies 2001-2004; Member International Committee ARVO 2002-2004; Member International Advocacy Committee ARVO 2002-2004 ; Member and Governor International Society for Imaging in the Eye 2000-2004. Member of the Executive committee of Glaucoma International Congress of Ophthalmology.

Ernst R. Tamm, MD

Title: Professor and Chairman
Affiliation: University of Regensburg, Institute of Human Anatomy, Regensburg, Germany.
Research Interests: Molecular pathogenesis of primary open-angle glaucoma; Control of gene expression in the outflow pathways of aqueous humor; Development of genetically engineered mouse models for primary open angle glaucoma; Molecular regulation of anterior eye development.
Leadership Positions: Professor and Chairman, Institute of Human Anatomy, University of Regensburg, Regensburg, Germany; Associate Professor and Head of Section Molecular Anatomy and Embryology, Department of Anatomy, University of Erlangen-Nürnberg, Erlangen, Germany. Member Editorial Board '*Experimental Eye Research'*, Section Editor 'Aqueous Humor and Outflow Pathways'; Member Editorial Board *'Current Eye Research';* Member Scientific Advisory Committee of the Glaucoma Research Foundation, San Francisco, CA..

Hidenobu Tanihara, M.D.

Title and Affiliation: Professor and Chairman, Department of Ophthalmology & Visual Science, Kumamoto University, Graduate School of Medical Sciences, Honjo 1-1-1, Kumamoto 860-8556, Japan.
Research Interests: Molecular and cellular biology. Neuro-protection and –regeneration. Surgical treatment for glaucoma. Signal transduction and development of novel drugs
Special Honors: Suda Award from Japan Glaucoma Society (1999).

Gülgün Tezel, M.D.

Title and Affiliation: Associate Professor, Department of Ophthalmology & Visual Sciences, Department of Anatomical Sciences & Neurobiology, University of Louisville School of Medicine, Louisville, Kentucky, U.S.A.
Research Interest: Cellular and Molecular Mechanisms of Glaucomatous Optic Nerve Degeneration. Retinal Ganglion Cell/Glia Interactions Neuroprotection in Glaucoma.
Special Honors: Recipient of the 2004 Research to Prevent Blindness Sybil B. Harrington Scholars Award.

Ravi Thomas M.D.

Title and Affiliation: Director, L.V. Prasad Eye Institute, Hyderabad, AP, India.
Research Interests: Glaucoma, Strabismus & Cataract.
Special Honors: WHO consultant for Development of a draft National Plan of Action For Control of Blindness in Jordon, July 1999.

John Thygesen, MD

Title and Affiliation: Associate Professor, Director of the Glaucoma Clinic, Copenhagen University Eye Clinic, Dept. of Ophthalmology, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark.
Research interest: Glaucoma: Ocular pharmacology, Glaucoma medical therapy, Glaucoma surgery. Lasers and Epidemiology.
Leadership positions: Member of the Executive Committee and the Educational Committee of The European Glaucoma Society (EGS). EGS representative at the Association of International Glaucoma Societies.

Karim F. Tomey, M.D., F.A.C.S., F.R.C.Ophth.

Title and Affiliation: Consultant Ophthalmologist/Chief, Glaucoma, Division – Beirut Eye Specialist Center, Rizk Hospital – Beirut, Lebanon.
Special Honors: Gold Medal Award – Pan Arab Council of Ophthalmology 1997

Carlo Enrico Traverso, M.D.

Affiliation: Clinica Oculistica, Department of Neurosciences, Ophthalmology and Genetics, University of Genova, Italy.
Research interests: Psycophisics, surgery, imaging, stem cells.
Leadership position: Executive Committee of the European Glaucoma Society (at present). Program Planning Committee Chair – Glaucoma, ARVO (1998); Steering Committee for the Association of International Glaucoma Society; Executive Committee for the Associazione Italiana per lo Studio del Glaucoma;
Special Honors: Italian Ophthalmological Society Award for clinical research in 1991, the American Academy of Ophthalmology Honor Award in 1993 and the AIRCMO Award for research in ophthalmology in 1999.

Anja Tuulonen

Title and Affiliation: Professor, Department of Ophthalmology, University of Oulu, Finland.
Research interests: Glaucoma diagnostics. Evidence Based Medicine evaluation of glaucoma research. Cost-effectiveness. Prioritising. Health care structures.

Leadership positions: Committee for Continuous Medical Education, University of Oulu.

Ananth C Viswanathan BSc (Hons) MBBS(Lond) FRCOphth MD
Affiliations: Consultant Surgeon (Glaucoma), Moorfields Eye Hospital, London; Honorary Senior Clinical Research Fellow, Inst. of Ophthalmology, London; Member of Statistical Genetics Group, Inst. of Psychiatry. London, United Kingdom.
Research interests: Quality of life in glaucoma. Visual psychophysics in glaucoma. Complex genetics in common eye disease.
Leadership positions: Chairman of GlaucoGENE (European Glaucoma Society Genetic Epidemiology Network); Chairman of UK Glaucoma Early Diagnosis Programme; Member of AIGS Junior Advisory Board; Member of European Glaucoma Panel.
Special honors: Member of Honorary Medical Advisory Panel to the Secretary of State on Visual Disorders and Driving.

Peter Walter, M.D.
Title and Affiliation: Professor of Ophthalmology, Director and Chairman, Department of Ophthalmology, Technical University Aachen, Germany.
Research Interests: Development and Test of active implants for the eye: Retina Implant, Pressure Sensors, Vision Aids. Functional diagnostics of the visual system: clinical and experimental electrophysiology. Surgical approaches to macular degeneration.

Ning-Li Wang, MD. PhD.
Title and Affiliation: Chairman of Beijing Tong Ren Eye Center; Professor of Ophthalmology; Doctorial Tutor of Ophthalmology; Director of Glaucoma Department; Beijing, People's Republic of China.
Research Interests: Gene therapy. Treatment of glaucomatous optic neuropathy.
Special honors: The quantitative study of angle configuration of PACG by UBM. Excellent Paper Award. Chinese glaucoma Society, Chinese Medical Association. 1999.

Robert N. Weinreb, M.D.
Title and Affiliation: Distinguished Professor of Ophthalmology, Director, Hamilton Glaucoma Center, University of California, San Diego, La Jolla, California, U.S.A.
Research Interests: Glaucoma diagnosis. Optic nerve (optic disc and retinal nerve fiber layer) imaging. Molecular and cellular mechanisms of aqueous outflow. Molecular and clinical aspects of glaucoma neuroprotection. Wound healing and glaucoma surgery.
Leadership Positions: President, Association of International Glaucoma Societies (AIGS); President-Elect, American Glaucoma Society (AGS); Board of Governors, Association of International Glaucoma Societies (AIGS).
Special Honors: Helmholtz Award for Research Excellence; AIGS-Award for Outstanding Glaucoma Research; Research to Prevent Blindness Physician-Scientist Award; Best Doctors in America; University of California San Diego, Outstanding Teacher.

Dr Tony Wells
Title and Affiliation: Senior Lecturer, Wellington School of Medicine, Wellington, New Zealand.
Research Interest: Glaucoma Surgery and Bleb Grading. Pseudoexfoliation Syndrome. Imaging.
Leadership positions: Head of Ophthalmology Unit, Wellington School of Medicine.

Wheeler, Larry A., PhD
Research Interest: Cell signaling and neuroprotection; glaucoma; aqueous humor dynamics; pharmacology; photoreceptor protection; apoptosis; alpha-2 agonists; NMDA receptors; glutamate; Ca^{2+} homeostatsis.
Leadership positions: Senior Vice-President, Biological Sciences, Discovery Research, Allergan, Inc., Irvine, CA

Richard P. Wilson
Title and Affiliation: Professor of Ophthalmology, Jefferson Medical College, Philadelphia, Co-Director, Glaucoma Service, Wills Eye Hospital, Philadelphia, Pennsylvania, U.S.A.
Research Interests: Emerging techniques of glaucoma therapy, with special emphasis on laser and cutting surgery, and pediatric glaucoma.
Leadership Posistions: Outgoing President of the American Glaucoma Society; Board of the Eye Care America Glaucoma Program, the American Academy of Ophthalmology's Foundation; Board of the Association of International Glaucoma Societies; Editorial Board of *Ocular Surgery News.*

M. Roy Wilson, M.D., M.S.
Title and Affiliation: President of the Texas Tech University Health Sciences Center, Lubbock, Texas, U.S.A.
Research Interest: Epidemiology and ophthalmology, especially in fostering the evolving field of glaucoma epidemiology.
Leadership Positions: Advisory Council and as Chair of the Strategic Plan Subcommittee for the National Center on Minority Health and Health Disparities (NIH). Elected lifetime membership in the Institute of Medicine of the National Academy of Sciences.

Wormald, Richard Piers Lesley, MSc

Title and Affiliation: Consultant Ophthalmologist, Moorfields Eye Hospital and Honorary Senior Lecturer, Institute of Ophthalmology and London School of Hygiene and Tropical Medicine, London, United Kingdom.

Tetsuya Yamamoto, MD

Title and Affiliation: Professor and Chairman, Department of Ophthalmology, Gifu University Graduate School of Medicine, Gifu-shi, Japan.
Research interest: Glaucoma management.
Leadership Positions: Glaucoma Society of the ICO (Active Member) ; Japan Glaucoma Society (Board Member).
Special Honors: Suda Award, Japan Glaucoma Society (1994).

Yeni H. Yucel MD PhD FRCPC (Neuropathology)

Title and Affiliation: Associate Professor, Director, Ophthalmic Pathology Laboratory, University of Toronto; Department of Ophthalmology & Visual Sciences, University of Toronto, Department of Laboratory Medicine & Pathobiology, St. Michael's Hospital, Toronto, Canada.
Research interest: Neuropathology of central visual pathways in glaucoma and neuroprotection.
Leadership positions: Director, Ophthalmic Pathology Laboratory, University of Toronto.
Special honors: Association of International Glaucoma Societies (IGR) 2001 Best Article Award October 19th, 2002 For Y.H. Yücel, Q. Zhang, R.N. Weinreb, P.L. Kaufman and N.Gupta. Atrophy of relay neurons in magno- and parvocellular layers of the lateral geniculate nucleus in glaucoma. IOVS, 2001, 42 (2001)3216-3222.

Linda M. Zangwill, Ph.D.

Title and Affiliation: Professor, Director, Diagnostic Imaging Laboratory, Department of Ophthalmology, University of California, San Diego, La Jolla, California, U.S.A.
Research Interests: To characterize structural damage in glaucoma using optical imaging instruments. To improve techniques for detection and monitoring of glaucomatous structural damage. To develop improved methods to measure the rate of glaucomatous progression. To characterize the complex relationship between structural and functional change over time. To identify risk factors for the development and progression of glaucoma.
Leadership Positions: Journal of Glaucoma Editorial board (since 1999); International Perimetric Society (Board member 2002- present); Glaucoma Society of the International Congress of Ophthalmology (elected 2002); UC San Diego The Sam and Rose Stein Institute for Research on Aging (elected 2004); Association for Research in Vision and Ophthalmology Professional Development and Education Committee (2003-2005); Association for Research in Vision and Ophthalmology Scientific Policy Subcommittee of the Advocacy Committee (2002-2004); Faculty Co-chair: UC San Diego Chancellor's Advisory Committee on the Status of Women (2004-2006).

Zhao, Jialiang, M.D.

Title and Affiliation: Director and Professor, Department of Ophthalmology, Beijing Union Medical College Hospital, Beijing; Professor, Department of Ophthalmology, PUMC Hospital, Eye Research Center, Chinese Academy of Medical Sciences, Beijing; Director, Eye Research Center of Chinese Academy of Medical Sciences, Beijing, China.
Research Interests: Glaucoma. Ophthalmic epidemiology.
Leadership positions: President, Chinese Ophthalmological Society; Editor-in-Chief, Chinese Journal of Ophthalmology; Member of Academia Ophthalmologica Internationalis.
Special honors: He is receiver of the Kupfer Award for Prevention of Blindness in 1999.

WORLD GLAUCOMA CONGRESS

This Meeting

The World Glaucoma Congress (WGC) was created because:

- Glaucoma needs a global meeting
- Glaucoma Societies need to get together / global communication
- AIGS is in the position to provide the highest quality meeting following its own Guidelines on Quality of Glaucoma Meetings, Guidelines on Reporting and Publishing and the Code of Practice, avoiding commercialization
- Glaucoma Societies and Glaucoma Industry Members have similar ethical scientific standards
- The WGC could serve as an example for other meetings
- The WGC will be a powerful stimulus for progress in glaucoma worldwide
- The WGC will have enhanced cost-effectiveness; it will be a non-profit meeting.

The WGC is primarily a didactic event. The participant should find a host of practical topics in addition to information on the latest developments of glaucoma science.

Target Groups

The WGC targets the Glaucoma Specialist as well as the General Ophthalmologist, who after all takes care of most of the glaucoma patients.

The WGC concept

- All star faculty (140 invited speakers)
- Oral presentations by invited faculty only
- Short and concise didactic lectures in the morning.
- Extensive courses in the afternoon
- Latest developments in four sessions (two opening sessions, sessions on 'From Science to Clinic' and 'Clinician Scientists: The Future of Glaucoma')
- Scientific posters, walkthrough, session, recognition
- Glaucoma Society sessions with nominated lectures by Glaucoma Society selected speakers and extensive discussion
- Personal contact with faculty in 'Meet the Expert' breakfast session
- Glaucoma Industry session under the responsibility of the organizing industry following the Guidelines on Quality and Quantity of Glaucoma Meetings.
- Evidence Based quality of presentations
- Various types of discussion
- Interactive questions
- Continuous Medical Education Credits
- Disclosure
- Evaluation
- Global AIGS-Award

Committees

WGC program Committee
R.D. Fechtner, I. Goldberg, F. Grehn, E.L. Greve (co-chair), R.A. Hitchings, P. Khaw, Y. Kitazawa, J.M. Liebmann, C. Migdal, K. Singh, R. Susanna, R. Thomas, R.N. Weinreb (co-chair)

Inaugural Assembly (Wednesday morning)
A. Azuara Blanco (co-chair), P. Chew, R.D. Fechtner, E.L. Greve, W. Lelis-Barboza, J. Thygesen, T. Yamamoto, R.N. Weinreb (co-chair), R.P. Wilson (co-chair)

Opening, Opening Lectures, Opening Symposium (Wednesday afternoon)
E.L. Greve, A. Heijl, R.A. Hitchings (co-chair), Y. Kitazawa, G. Krieglstein, R. Ritch, R. Susanna, N. Wang, R.N. Weinreb (co-chair)

Morning Lectures, Symposia, Round-table, etc. (Thursday, Friday, Saturday morning)
M. Araie (co-chair), R.D. Fechtner, F. Grehn, E.L. Greve, P. Khaw, J.M. Liebman (co-chair), H.A. Quigley, R.N. Weinreb

Glaucoma Societies (Thursday, Friday, Saturday afternoon)
I. Goldberg (co-chair), E.L. Greve, D. Grigera, Y. Jiang, C. Migdal, S. Seah, G.L. Skuta (co-chair), R. Thomas (co-chair), R.N. Weinreb

Courses (Thursday, Friday, Saturday afternoon)
M. Aihara, J. Crowston, P.J. Foster, E.L. Greve, M. He, H.G. Lemij, F. Medeiros, S. Miglior, K. Singh (co-chair), C. Traverso (co-chair)

Scientific Posters
B. Chauhan, G.A. Cioffi, A.L. Coleman (co-chair), D.S. Friedman, S. Gandolfi (co-chair), E.L. Greve, K. Kashiwagi, D.S. Minckler, P.A. Sample, R.N. Weinreb, M.R. Wilson, R.P.L. Wormald, L.M. Zangwill

GIM Sessions
J. Airaksinen, W.L.M. Alward, G. Cagle (Alcon), D. Grigera, E.L. Greve, R.A. Lewis, C. Migdal (co-chair), K. Singh (co-chair), G.L. Skuta, H. Tanihara, R.N. Weinreb

Consensus on Surgery
M. Araie, A.L. Coleman, J. Crowston, I. Goldberg, F. Grehn (co-chair), E.L. Greve, R.A. Hitchings, P. Khaw (co-chair), J.M. Liebmann, G.L. Skuta, R. Susanna, R. Thomas, R.N. Weinreb (co-chair), T. Yamamoto

Social Program Committee
Eurocongress Conference Management, Büro Wien, E.L. Greve, R. Halprin, A.B. Hommer, H.G. Lemij, P. Palmberg, G. Norrgren, R. Ritch, B. van der Veer, R.N. Weinreb.

Local Host
M. Eckhardt, C. Faschinger, P. Freigasser, A.B. Hommer (chair), A. Mistlberger, G. Rainer, K. Rigal, B. Teuchner, C. Vass

SCIENTIFIC PROGRAM OVERVIEW

Opening Ceremony

The Opening Ceremony has two ***themes***. The ***first theme,*** 'Alle Menschen werden Brüder' (Brotherhood unites all men) from Ludwig von Beethoven's Ninth Symphony symbolizes the global cooperation that the AIGS aims for. In his opening speech, the President will stress this aspect of the AIGS. The ***second theme*** is: glaucoma, the threat to vision; science is the drive behind halting glaucomatous progression; the AIGS vision of a united glaucoma world and, last but not least, the insight that may come to scientists beyond all reasoning (as great scientists like Einstein have expressed).
The music and text for this glaucoma hymn were specially written for the AIGS and the World Glaucoma Congress.

Opening Symposia

The Opening Symposia deal with important aspects of glaucoma as a cause of blindness, developments in basic glaucoma research that is on the threshold of clinical application.

Didactic Morning Sessions and Instruction Courses

The Didactic Morning Sessions consist of short and concise presentations by experts on all aspects of Glaucoma Management. They form an inseparable unity with the courses. The morning lectures and discussions should be seen as a pointwise presentation of the latest insights in Glaucoma Management. The courses will elaborate on many of the same topics in more detail and in exchange with the participants.

Global Guidelines on Diagnosis and Treatment

Several member societies of the AIGS (AGS, EGS, JGS, SEAGIG) have made Guidelines for Diagnosis and Treatment. These Guidelines reflect the specific economical and geographical situation in each of the regions covered by these Guidelines. The AIGS will attempt to create a general global overview of these Guidelines with emphasis on similarities as well as on differences. A short report on these Guidelines will be presented on Friday, July 8, 11.50 AM (D61)

From Science to Clinic (062 – D068)

This session aims at presenting developments in science that may have an impact on clinical practice in the future. Speakers are all clinicians involved in science, with the exception of Elke Lütjen-Drecoll, who is a professor of anatomy. Each presentation will be summarized in plain words by the chairs. The session will start with an explanatory introduction and will end with a brief overview by the chairs.

Consensus on Structure and Function

The Consensus on Structure and Function (held in November 2003) was published in the book 'Glaucoma Diagnosis: Structure and Function' in 2004. A Consensus is an ongoing process that needs updating at regular intervals, especially in a field that moves so rapidly as the diagnosis of structural and functional abnormalities. A short update will be presented on Thursday July 7, 9.50 AM (D26). A complete update is envisaged as part of the regular AIGS Consensus Program.

Consensus on Glaucoma Surgery : Open Angle Glaucoma

A Consensus Meeting with more than 90 experts was held on April 30, 2005 in Fort Lauderdale, Florida, US. The results of this second Global AIGS Consensus Meeting on Glaucoma Surgery will be published in a book. A complete session of the WGC will be devoted to the Consensus Statements which will be presented and discussed Saturday, July 9, 10.30 AM – noon (D83 – D96).

The Future of Glaucoma: Clinician Scientists

The AIGS recognizes the vital position of the glaucoma clinician scientists. This session has the symbolic name 'The Future of Glaucoma' indicating how much the development of glaucoma science, and subsequently diagnosis and treatment, depends on the clinician scientists. The presenting clinician scientists in this session were nominated by the member glaucoma societies of the AIGS. The presenting six were selected by the Program Committee. Robert Weinreb will summarize the future of Glaucoma Research. The final Future of Glaucoma lecture will be presented by Roger Hitchings. Saturday, July 9, 4.30 – 5.30 PM (D106 – D113).

Posters

It should be emphasized that the AIGS has purposely chosen ***scientific posters*** as the only mode of free, original presentations at the congress. Posters are an excellent and important way of providing scientific information. The AIGS is making an effort to provide high visibility for the posters, by declaring them to be the exclusive medium for free presentations.

The posters will be on from Wednesday July 6 noon till Saturday July 9, 5.00 PM.

Poster Mounting and Removing

Posters should be mounted on Wednesday, July 6, between 09.00 AM - noon. After 12.00 hours no posters can be mounted. Assistance and material for mounting the posters (tape) will be available from 09.00 AM, at the desk in the Poster area.

Posters should be removed after 14.00 and before 17.00 hours on Saturday, July 9. Posters that have not been taken down by the author(s) will be removed and destroyed by the AIGS Meeting Office.

Poster Walk-through

Apart from the individual visits of participants to the posters there will be an official visit by the WGC Poster Committee, AIGS Board of Governors, Steering Committee and Glaucoma Society Representatives. The poster authors have to be present at their poster on Thursday, July 7, during the Poster Walk-through 4.45 PM – 5.45 PM. Authors are requested to indicate on their posters other times they will be available at their poster. This usually will be during one of the breaks.

The Glaucoma Society Structure posters will also be visited during the Poster Walk-through.

Poster Session

The selection of the Top-ten posters that will be discussed during the Poster Session will be done during the Poster Walk-through. The selected posters will be indicated by a selection sign which will be attached to the poster at 6.00 PM.

SELECTED POSTER

Authors should check their poster board immediately on Friday morning, July 8, for a sign that indicates selection for the poster session. If their poster is selected, authors should report to the poster session administrator for instructions. The Top-ten selected poster authors will present their poster in two slides (3 minutes) during the poster session on Friday afternoon (July 8, 4.30-6.00 PM). Following this presentation the poster will be discussed by members of the poster committee and their invited discussants (5 minutes per poster).

Poster Recognitions

At the end of the Poster Session the Poster Committee will announce the ***three best*** posters which will receive the **World Glaucoma Congress Poster Recognition**.

Special Attention Flags

Apart from the selection of posters for the Poster Session and Recognition the Poster Committee will give ***special attention flags*** to posters that have caught the special attention of the members of the Poster Committee, other than those selected for the poster session.

Special Attention

Meet the Experts Breakfast Table Discussions

A unique occasion to discuss questions of practical importance with members of the faculty will be the 'Meet the Expert' breakfast sessions. There will be 15 tables, each with two experts and eight participants, on Thursday and Friday morning. Total 42 tables, *i.e.* place for 336 registrations. Cost: zero. Time: 7.30-8.15 AM. Location: *Restaurant Piazza* on the first floor in the Conference Center.
Organization: the attendees may prepare questions to the faculty members, who will discuss the subject of the question. Discussion time per question will be 5 minutes maximum so as to allow each participant at least one question. There will be no projection. Information on cases should be provided on paper or by means of a laptop.

Table chairmen:

Thursday, July 7, 2005. 07.30 – 0815.
Table 1: D.S. Minckler and F. Grehn
Table 2: S. Obstbaum and J.B. Jonas
Table 3: P. Palmberg and A.G.P. Konstas
Table 4: R.K. Parrish and Y. Lachkar
Table 5: P. RojanaPongpun and H.G. Lemij
Table 6: T. Wells and N. Pfeiffer
Table 7: R. Ritch and T. Shaaraway
Table 8: Shields and P. Shah
Table 9: K. Singh and A. Tuulonen
Table 10: G.L. Skuta and R.P.L. Wormald
Table 11: G.L. Spaeth and M. Araie
Table 12: R.L. Stamper and R. Burk
Table 13: Rick Wilson and S. Melamed
Table 14: Roy Wilson and J. Ge
Table 15: I. Goldberg and D. Grigera
Table 16: S. Gandolfi and W.L.M. Alward
Table 17: R.A. Hitchings and I.K. Ahmed
Table 18: P.T. Khaw and P.R. Healey
Table 19: C. Migdal and M.S. Jaafar
Table 20: A.L. Coleman and C. Traverso
Table 21: A. Alm and G.C. Sekhar
Table 22: D.F. Garway-Heath and T. Wells

Friday, July 8, 2005. 07.30 – 08.15.
Table 1: J.D. Brandt and G. Marchini
Table 2: D.L. Budens and S. Miglior
Table 3: C.F. Burgoyne and A. Mermoud
Table 4: C.B. Camras and P. Mitchell
Table 5: J. Caprioli and D. Lam
Table 6: G.A. Cioffi and T. Yamamoto
Table 7: A.S. Crandall and L.E. Pillunat
Table 8: R.D. Fechtner and G. Michelson

Table 9: C.A. Girkin and J. Thygesen
Table 10: D.S. Greenfield and H. Tanihara
Table 11: R.L. Gross and R. Thomas
Table 12: D.K. Heuer and Y. Kuwayama
Table 13: A.D. Realini and K.F. Tomey
Table 14: L.J. Katz and A. Azuara Blanco
Table 15: P.L. Kaufman and R. Susanna
Table 16: T. Krupin and R. Sihota
Table 17: R.P. LeBlanc and K. Barton
Table 18: P.P. Lee and C. Baudouin
Table 19: L.A. Levin and R.G. Carassa
Table 20: R.A. Lewis and M. Diestelhorst
Table 21: J.M. Liebmann and J. Flammer

Glaucoma Industry Member Symposia and Workshops

The Glaucoma Industry Members (GIM) will organize their own Symposia and Workshops. This has been done in concert with the WGC organization. The GIM organizer holds responsibility for the scientific content of the GIM Symposia and Workshops. See p. 47 for AIGS Rules on Glaucoma Industry Member involvement.

Discussions and Interactive Questions

The WGC will have the following types of discussions:

- Invited panel discussions (Didactic Morning Sessions, Glaucoma Society Sessions)
- Open discussions during the courses and Meet the Expert breakfast tables
- Poster discussions during
  - o Walk-through: general
  - o Poster Session: Poster Committee

In addition to the discussions there will be frequent interactive questions (IAQ) during most of the sessions, in order to give the participants the opportunity to express their opinion on several issues discussed at the WGC. IAQ may also be used to measure the impact of lectures or discussions on participant management decisions.

Language

English.

Quality of Evidence

Global AIGS Guidelines on Reporting and Publishing, and on Quality and Quantity of Glaucoma Meetings

From the beginning the AIGS has emphasized the importance of scientific quality of its presentations and discussions. It has therefore published two reports that deal with these quality aspects: Global AIGS Guidelines on Reporting and Publishing, and Global AIGS Guidelines on Quality and Quantity of Glaucoma Meetings. The WGC will be an exercise in maintaining these ambitious levels. For reports *see* www.globalAIGS.org

For Quality of Evidence the WGC has adapted the Minckler - AAO Quality of Evidence levels:

Level I: (Interventional) Evidence obtained from at least one properly done, well-designed randomized controlled trial or meta-analyses of high quality randomized controlled trials.

(Observational) Evidence obtained from well-done population-based prevalence or incidence studies.

Level II: (Interventional) Evidence obtained from well-done non-randomized comparative trials or well-done systematic literature reviews summarizing primarily level II publications.

(Observational) Evidence obtained from high quality case-control and cohort studies.

Level III: (Interventional or Observational) Evidence obtained from non-comparative case series, case reports, and expert or consensus opinion.

- The overall level of evidence rating cannot exceed that of the individual studies reviewed. All literature assessed is assumed to be peer reviewed.

Glossary

Case-control study. An observational (non-interventional, usually retrospective) study that begins by identifying individuals with a disease (cases) for comparison to individuals without a disease (controls or reference group), in which analysis proceeds from effect to cause.

Case report. Usually a retrospective report of a single interventional or observational case experience, often with clinical-pathological correlation.

Case series. Case series include those studies describing more than one consecutive or non-consecutive cases, studied retrospectively or prospectively, usually with regard to the outcome of an intervention for its efficacy, safety, and complications. Non-comparative case series generally have no control group included but outcome may be compared to that in the literature.

Cohort study. An observational study that begins by identifying individuals with (study group) and without (control group) a factor being investigated to observe over time with regard to disease outcome; study and control groups may be concurrent or non-concurrent but must be derived from the same well defined cohort; almost always prospective with regard to data collection. Almost always longitudinal in that a particular group of patients is followed forward from a point in time. May or may not be population-based.

Comparative study. A study including two or more defined groups, compared to eachother, to make a

judgment about the influence of some factor or treatment.

Cross-sectional study. An observational study that identifies individuals with and without the condition or exposure being studied at the same time (synonymous with prevalence study). May or may not be population-based.

Interventional study. A study that includes an attempt to alter the course of disease by medical or surgical or other therapy.

Observational study. A study without intervention or attempt to alter the natural course of disease or physical condition.

Audio Visual Support – Speaker Ready Room

The Speaker Ready Room will be open July 6: 8 a.m. – 6 p.m., Thursday July 7 and Friday July 8: 7.00 a.m. – 6 p.m. and Saturday July 9: 8 a.m. – 5.00 p.m.
Equipment to enable a final check to be made for your presentation is available in the Speaker Ready Room.

Power Point presentations: we strongly advise you to bring your presentation to the Speaker Ready Room AT LEAST 3 HOURS BEFORE the start of your lecture.

Please note that there are no facilities to use laptops in the session rooms.

Travel Grants

The AIGS has granted close to 40 travel grants, which include waiving of the registration fee, to glaucoma clinician scientists under forty years of age who have demonstrated a special interest in glaucoma.

Continuing Medical Education – see page III and IV

Meeting Evaluation

It is essential for assessing the quality of the WGC that participants take time to complete the evaluation forms. Every participant can have an impact on the planning for the next WGC. The AIGS has purposely created this elaborate evaluation system in order to provide the participants with an even better congress in two years. Your input is highly appreciated.

Relationship with Glaucoma Industry Members

The AIGS has deliberately chosen for a close contact with Glaucoma Industries. It is realized that Glaucoma Industry is an important force in the world of glaucoma both in research as well as in education. The AIGS aims to improve science and care of glaucoma in cooperation with its Glaucoma Industry Members. In joint committees the AIGS has established rules for the relationship with industry:

- AIGS Code of Practice
- AIGS Guidelines on Reporting and Publishing
- AIGS Guidelines of Quality and Quantity of Glaucoma Meetings

These guidelines follow the trend in specialist-industry relationship as expressed in the scientific literature, while focussing on the special aspects related to the AIGS organization

Industry Involvement

Excerpt from Global AIGS Guidelines on Quality and Quantity of Glaucoma Meetings:

1. The AIGS encourages appropriate interactions between glaucoma specialists and glaucoma industry. It encourages partnership with glaucoma industry in conducting meetings of the highest scientific quality while fostering quality professional relationships.
2. All presentations on new industry scientific findings should be within the official scientific program of the meeting and as such reviewed by the scientific program committee.
3. Proposals for lectures or a group of lectures made by industry will be treated as any other proposal to the scientific program committee. Such proposals should be purely scientific and balanced, *i.e.* not promotional. The opportunity to propose topic and speaker does not imply a right to have them on the program. There will be competition with other proposals for the program. They will not be called industry sponsored symposia.
4. It was also agreed that industry opportunities for scientific presentations would be either within the official scientific program and under the full responsibility of the scientific program committee as mentioned above, ***or*** outside the scientific program and under the responsibility of industry. Other options are ***not*** recommended. The audience may place a higher value on presentations scientifically scrutinized than presentations with a commercially sponsored flavor. Even when so-called sponsored symposia are organized under industry responsibility, such symposia should still have a high quality level, as neither the Program Committee nor the individual sponsor will benefit from mediocre, clearly promotional symposia. Regarding sponsored symposia, parties agreed that competing events should be avoided for the major symposia. For organizational reasons industry sponsored symposia may be scheduled in concert with the Program Committee.
5. Appropriate scientific agenda scheduling will be part of the task of the program committee.
6. A checklist for essential requirements for abstracts will be used (see addendum).
7. Rejection of abstracts will be based on the list of 'Reasons for Rejection'. See addendum.

TABBLAD ADVERTENTIE PFIZER


www.nehelenia.de

SOCIAL PROGRAM


JOHANN
STRAUSS

The Social Program has been the subject of extensive deliberation. On the one hand it is vital to bring participants together outside the scientific sessions, to show participants the greatness of Austrian culture, to create an amiable ambiance for networking and to create an unforgettable extra-scientific, memory of the WGC in Vienna.
On the other hand the AIGS desires to spend the vast majority of its funds and devote most of its time and energy on scientific and educational matters. A deliberate choice was made for a classical reception and a banquet, one free evening and ***one unbelievably memorable evening: The Imperial Viennese Glaucoma Ball***, a splendid mixture of dining, culture and dancing: the most typical extra-scientific Viennese celebration.

Wednesday evening (July 6), 7.00-9.00 PM

Opening Reception by the Mayor in the Rathaus
(City Hall), Rathausplatz 1
The Rathaus is one of the most splendid of the numerous monumental buildings on Vienna's Ringstrasse. Designed by Friedrich Schmidt (1825-1891), it was erected between 1972 and 1883. Visitors are stunned by the magnificent appointments of the state rooms, which frequently provide the atmospheric backdrop to events such as receptions, concerts and balls. This reception is a must if you want to witness the splendour of nineteenth-century Vienna (Franz Joseph and Sisi). Included in the registration fee of participants and accompanying persons.
Supported by an unrestricted educational grant from Alcon and Pfizer.

Friday evening (July 8), 7.30 PM -1.00 AM

The Imperial Viennese Glaucoma Ball

The Imperial Viennese Glaucoma Ball will be held at the Imperial Palace 'Hofburg' in Vienna.
Every country, every city has its own traditions. 'When in Vienna, do as the Viennese do'. Well, the Viennese have a ball. An old and very popular tradition. And a real ball it will be, with the glory of the past on the one hand and modern excitement on the other hand. The highlight of the Imperial Viennese Ball is always the Waltz: music and dance. The Waltz that has kept the Viennese in training for almost two centuries. The Waltz that is linked with the name of Johan Strauss and many other composers.
However, the Imperial Viennese Glaucoma Ball will have much more than that: dining with delicacies from many regions of the world. There will be sixteen larger and smaller sumptuously decorated halls which will be transformed into ballrooms, theatres, restaurants, etc. They will be used for an unsurpassed mixture of music, ballet, dancing (Waltz, Salsa, Jazz, DJ), restaurants, artists, acrobats and much more.

The preliminary and highly exciting program of the Imperial Viennese Glaucoma Ball:
- Entrée into the Imperial Palace with reception in the Celebration Hall and various other rooms; music by Strauss Trio
- Pre-opening with classical and modern ***ballet***
- Opening by the President of the AIGS
- Post-opening: the typical Viennese ***Waltzing Ceremony***
- Dining and dancing
- Historical and contemporary ***fashion show*** including modelling by professors of glaucoma
- Latin American ***percussion demonstration***
- Samba extravaganza
- ***Firedancers*** from Australia

- ***Grand Finale*** with opera and operetta fragments ending in an extravagant surprise

In the olden days of Vienna congresses and balls were inseparable. The Imperial Viennese Glaucoma Ball is the vibrant nucleus of the extra-scientific program of the WGC. A one-time event. A must for every participant. There will be something to enjoy – if not everything – for every taste.

The **Hofburg Palace** complex was constructed between the thirteenth and twentieth centuries. Seven centuries of constant building activity have shaped its architecture. The various wings portray the architecture of the Gothic, Renaissance and Baroque periods up to the Classicism. Until 1918, the Hofburg Palace was the seat of the Habsburg dynasty and during that time almost all the various regents either restored, expanded or redesigned the palace for their own use. This magnificent building has hosted many historical meetings, such as the Congress of Vienna in 1814-1815, which established the new European order after the victory over Napoleon I, and the signing of the Salt II Agreement by US President Carter and USSR President Breshnjev in 1979.

Evening Dress Rental

Lambert Hofer Kostüme, Simmeringer Hauptstrasse 28, A-1110 Wien. Tel. (1) 740 90

Saturday (July 9), 7.00 – 9.00 PM

The Farewell Party in the Albertina Museum, Albertinaplatz 1
This is perhaps the most beautiful farewell from Vienna that anyone can imagine. The Albertina museum hosts one of the largest and most valuable collections of graphic art in the world. Currently the collection consists of approximately 65,000 drawings and nearly one million prints covering all of the major art-historical epochs from the late Gothic to the contemporary Modern.
The range of exemplary works stretches from **Raffaelo Santi, Michelangelo Buonarroti, Leonardo da Vinci, Albrecht Dürer, Rembrandt van Rijn, Peter Paul Rubens** and **Claude Lorrain** to **Eugène Delacroix, Édouard Manet** und **Paul Cézanne**. In the twentieth century, the Albertina boasts extensive inventories of works by **Egon Schiele, Gustav Klimt** and **Oskar Kokoschka** through **Pablo Picasso** up to **Robert Rauschenberg** and **Anselm Kiefer.**
Duke Albert of Saxon Teschen (1738-1822) – founder of the collection and the palace's eponym – established the basis of the Albertina's current holdings together with his wife Marie Christine, a daughter of Maria Theresa, in the course of fifty years of activity as a collector. The enlargement of the palace to its present dimensions was carried out by Archduke Carl, victor in the great battle against Napoleon at Aspern. Following Albert's death, the collection was expanded by his successors. With the collapse of the Habsburg monarchy it passed into the possession of the newly established republic. In 1920 it was united with the print collection of the former Imperial Court Library, and since 1921 it has carried its current name: Albertina. The collection is continually growing through new acquisitions, whereby emphasis is put on the purchase of highlights of international contemporary art. The museum was recently restored in its magnificent glory. From the balcony one has a gorgeous view over the historical buildings neighbouring the Albertina. On a warm July evening with the reddish colors of the sunset this will be an unforgettable experience. Participants will be able to visit the rooms of the museum during the Banquet. Drinks and food will be provided.

Supported by an unrestricted educational grant from Pfizer and Alcon

Accompanying Persons Program

Thursday, July 7, 2005, 2 p.m. Duration: approx. 3.5 hours
Historical Vienna with tour through Schönbrunn Palace
To provide you with a first impression of the city, we start our tour at the Ringstrasse. This boulevard, with an approximate length of four kilometers, was created in the course of the city's first expansion in the middle of the nineteenth century on the area of the former Glacis. We will see buildings like the Museum of Fine Arts, the Natural History Museum, the City Hall, the Burgtheater, the Parliament, the University, and many more. The highlight of our excursion is a tour through Schönbrunn Palace, the summer residence of the former Imperial House of Austria.

Friday, July 8, 2005, 8 a.m. Duration: approx. 9 hours
Romantic Danube Valley – 'Wachau'
We start our tour per bus to Wachau, the romantic Danube valley situated outside Vienna. Our first destination is Melk, where we visit the magnificent Baroque monastery and admire the breathtaking view of the Danube. After lunch we go on a boat trip on the Danube, which takes us from Melk to Spitz. Past the picturesque town of Dürnstein with its Kuenringer castle, where 800 years ago King Richard I Lionheart was held prisoner, we continue by bus to Krems. In Krems, in the course of a short walk, you will have the opportunity to take a look at the medieval town center with numerous churches adorned with frescos by the Baroque painter 'Kremser Schmidt'. After that, we will return to Vienna.

Registration for the Social Program see page 74

TABBLAD ADVERTENTIE PFIZER

KEERZIJDE TABBLAD

TECHNICAL EXHIBITION

Hier komt nog de plattegrond van de exhibition

An extensive exhibition of pharmaceutical, technical and research products, equipment, books, journals, services, etc. is organized in conjunction with the World Glaucoma Congress. The scientific program will allow participants ample time to visit the exhibits.

Opening hours

The exhibition area in Foyer A will be open at the following hours:

Wednesday, July 6 11.00 a.m. – 6.00 p.m.
Thursday, July 7 9.30 a.m. – 6.00 p.m.
Friday, July 8 9.30 a.m. – 6.15 p.m.
Saturday, July 9 9.30 a.m. – 5.00 p.m.

List of exhibitors *(in alphabetical order)*

Company name	Booth number
AIGS / IGR	20
Alcon Laboratories Inc.	4
Allergan Inc	1
AMO Germany GmbH	14
Carl Zeiss Meditec AG	8
European Society of Cataract and Refractive Surgery	18
Haag-Streit AG	10
Heidelberg Engineering	7
International Glaucoma Association	11
Kowa Europe GmbH	17
Laserex	21
Medtronic Ophtalmics	15
Merck Sharpe & Dohme	3
Ocular Surgery News Europe/Asia-Pacific	13
Oculus Optikgerate GmbH	9
Ophthalmology Times	19
Optonol AG	24
Pfizer Inc	2
Ryazan State Instrument-Making Enterprise	26
Santen OY	5
Solx, Inc	12
Staar Surgical AG	23
Talia Technology GmbH	16
Wisepress Online Bookshop Ltd.	25
Ziemer Ophthalmic Systems AG	6
3W Informed	22

Company profiles (in alfabetical order)

Alcon Laboratories, Inc.

Alcon Laboratories, Inc. develops, manufactures and markets ophthalmic pharmaceuticals, ophthalmic surgical equipment and devices, contact lens care products and other consumer eye care products that treat diseases and conditions of the eye. Our broad range of products represents the strongest portfolio in the ophthalmic industry, and we have leading market share positions across most major product categories.

With sales in 2004 of $3.9 billion dollars, Alcon's mission is clear: to discover, develop, produce and market innovative, high quality eye care products that preserve, restore and enhance sight. Alcon will accomplish this by partnering with eye care professionals around the world to advance the treatment of eye disease and help people experience the best vision possible. At Alcon, we are dedicated to fostering new innovation for eye care, as well as converting new discoveries into commercially viable products. Alcon will invest in excess of $2.5 billion in research and development over the next five years, more than any other ophthalmology company.

Allergan

Allergan, Inc., with headquarters in Irvine, California, is a global specialty pharmaceutical company that develops and commercializes products for eye care, neuromodulator, skin care and other specialty markets. In addition to our discovery-to-development research programs, Allergan has global marketing and sales capabilities in over 100 countries that deliver value to our customers, satisfy unmet medical needs and improve peoples' lives. Our mission is to become the partner of choice for ever better health care through the value of our technological innovation, industry leadership, partnering skills and relationships, worldwide infrastructure, research and manufacturing capabilities.

The products developed and marketed by Allergan for the treatment of glaucoma are Alphagan® (Alpha-2 selective agonist) and Lumigan® (Prostamide). All information will be available at the booth.

ALLERGAN Inc., Corporate Headquarters, 2525 Dupont Drive, Irvine, CA 92612, USA. Contact: Aleka Garcia, Tel: + 1-714-427-3602; Fax: +1-714-427-3629; E-mail: Garcia_aleka@allergan.com; Website: www.allergan.com

Advanced Medical Optics (AMO®)

Advanced Medical Optics (AMO®) is a global medical device leader, focused on discovery and delivery of

innovative vision technologies that optimize quality of life for people of all ages. Products in the ophthalmic surgical portfolio include intraocular lenses, phacoemulsification systems, ophthalmic viscosurgical devices (OVDs), glaucoma implants, microkeratomes and related products used in cataract, refractive and glaucoma surgery. AMO owns or has rights to such ophthalmic surgical brands as ReZoom™, PhacoFlex®, ClariFlex®, Array®, Sensar®, CeeOn®, TECNIS®, and Verisyse® intraocular lenses, Sovereign® and Sovereign® Compact™ phacoemulsification systems with WhiteStar™ technology, AMADEUS™ and AMADEUS™ II microkeratomes, Healon® and Vitrax® OVDs, and the Baerveldt® Glaucoma Implant.
Products in the contact lens care line include disinfecting solutions, daily cleaners, enzymatic cleaners and lens rewetting drops. Among the contact lens care product brands the comppany possesses COMPLETE® Moisture PLUS™, Complete® Blink-n-Clean®, Consept® F, Consept® 1 Step, Oxysept® 1 Step, Ultracare®, Ultrazyme®, Total Care®, and blink™ branded products. Amadeus is a licensed product and trademark of SIS, Ltd. OptiEdge is a registered trademark of Ocular Sciences. AMO is based in Santa Ana, California, employs approximately 3,000 people, has operations in about 20 countries, and markets products in approximately 60 countries around the world.
For more information, visit our website: www.amo-inc.com.

AMO Germany GmbH, Rudolf-Plank-Str. 31, 76275 Ettlingen, Germany.
Tel: +49-7243-729-0.

Carl Zeiss Meditec AG

Carl Zeiss Meditec AG is one of the world's leading eye care solutions providers.
The company has its own subsidiaries in USA and Japan, the world's most important markets. In all other countries Carl Zeiss Meditec can avail itself of the worldwide distribution channels of the Carl Zeiss Group: with about 40 distributors and more than 100 agencies we operate in all four corners of the globe.
Structure and function products by Carl Zeiss Meditec provide solutions to assist throughout all stages of glaucoma.
You will benefit from fast, reliable measurements and powerful normative databases:

- Diagnosis of structural changes in the RNFL with the GDx VCC™,
- real-time cross-sectional images of the optic nerve head and RNFL thickness with the STRATUSOCT™,
- 3D imaging of optic nerve head with FF 450^{plus} and VISUPAC as well as the instruments of our VISUCAM family,
- functional measurement of visual fields with the HFA II-i,
- efficient and effective detection of visual field loss with FDT (Frequency Doubling Technology),
- fast and accurate perimetry screening, glaucoma management and visual field testing up to 30° with Humphrey® Matrixfast and accurate perimetry screening, glaucoma management and visual field testing up to 30° with Humphrey® Matrix,
- precise and gentle treatment with VISULAS YAGIII Combi.

Carl Zeiss Meditec AG, Goeschwitzer Strasse 51-52, 07745 Jena, Germany. Phone: +49-36 41-220-333; Fax +49-36 41-220-282; e-mail: info@meditec.zeiss.com website: www.meditec.zeiss.com

Carl Zeiss Meditec Inc., 5160 Hacienda Drive, Dublin, CA 94658, U.S.A. Phone: +1 925 557 4100; Fax +1 925 557 4101; e-mail: info@meditec.zeiss.com website: www.meditec.zeiss.com

ESCRS EuroTimes

EuroTimes is the monthly news magazine for ophthalmologists published by the European Society of Cataract and Refractive Surgeons. EuroTimes is read by over 24,000 ophthalmologist in over 150 countries worldwide. It is the leading ophthalmic magazine published outside the United States. Our readers practice in a wide range of sub-specialities including glaucoma, cornea, retina and macular disease.

Haag-Streit

Haag-Streit provides a range of devices for diagnosis and treatment of glaucoma. Naturally our world-renowned slit lamp range was designed very much with glaucoma diagnosis in mind. The Goldmann applanation tonometer, set the standard for accurate reproducible measurement of intraocular pressure as one of the key parameters in Glaucoma diagnosis and treatment assessment. Central corneal thickness (CCT) is an increasingly important parameter, for glaucoma diagnosis as well as for refractive surgery, and our OLCR-Pachymeter allows fast, non-contact measurement of the CCT in unmatched precision. The OCTOPUS perimeter family, now also featuring true Goldmann kinetic perimetry, offers you the ultimate tool for early diagnosis and tracking of visual field loss. Practically all significant innovations in the field of

perimetry have been pioneered by Haag-Streit in the form of new models of the OCTOPUS perimeters with improved performance, or as add-ons or up-dates to existing equipment. Supplementary to this we have a full range of contact glasses for diagnosis and laser treatment. Haag-Streit: your partner for glaucoma diagnosis.

Contact Information: HAAG-STREIT AG, Gartenstadtstrasse 10, CH-3098 Koeniz,
Switzerland. Phone: +41 31 978 01 11; Fax: +41 31 978 02 82; E-mail: info@haag-streit.ch
Website: http://www.haag-streit.com

Heidelberg Engineering GmbH

Heidelberg Engineering GmbH, Germany shows State of the Art digital diagnostic solutions. The Heidelberg Retina Tomograph (HRT II) is a multi diagnoses platform. Developed for Glaucoma today it is the Gold Standard for early detection and objective ONH structure progression. The optional Retina Module makes the HRT II a must for every practice. The latest module for Corneal Tomography converts the HRT II to a laser-scanning microscope. It opens a new world of Cornea and Limbus in-vivo histology.
Our pocket pachymeter (165 g) IOPac advanced for easy pachymetry including IOP corrections should be your choice.
The Heidelberg Retina Angiograph (HRA 2) based on confocal laser scanning technology offers unprecedented Fundus imaging by dynamic Fluorescein or ICG Angiographies or both simultaneously. Together with the excellent Autofluorescenc images it is the choice of professionals.

Heidelberg Engineering GmbHG, Gerhart-Hauptmann-Str.30, 69221 Dossenheim,
Germany. Tel: +49 (0)6221-.64630; Fax: +49 (0)6221-646362; E-mail: info@heidelbergengineering.com
Website: www.heidelbergengineering.de

Kowa Europe GmbH

Nonmyd 7- Nonmydriatic fundus camera USB output, Nikon D-100 6Mpixel Digital Camera.
AP-5000C - Automatic Perimeter (Perimeter on Fundus image).
Website: http://kowa-europe.com

Laserex

Laserex has been a world leader in the development of innovative ophthalmic laser solutions for more than 15 years and continually strives to develop revolutionary treatment solutions which preserve vision and improve patient care. Innovation is the key driving force at Laserex, as demonstrated by our strong technology platform and leading integrated laser + slit lamp design. Our extensive range includes Nd:YAG laser photodisruptors for the treatment of anterior eye diseases, such as posterior capsule opacification and closed-angle glaucoma, green laser photocoagulators for the treatment of retinal eye diseases, and SLT laser systems for the effective management of glaucoma.
Laserex is passionate about the treatment of glaucoma and is committed to providing ophthalmologists with innovative treatment solutions in the management of this degenerative disease – one of the leading causes of blindness today. We have played a major role in the development of Selective Laser Trabeculoplasty (SLT), a gentle but effective laser alternative which lowers intraocular pressure (IOP) by an average of 25% in 75–85% of patients treated. We are the only manufacturer of the SLT/YAG combination laser system, and have recently introduced the world's only fully integrated SLT-dedicated laser system.

Medtronic – Advancing Ophthalmology

Medtronic delivers differentiated diagnostic and surgical solutions for all specialties with an emphasis on glaucoma. The Tono-Pen® XL provides accurate, portable IOP measurement and the Model 30™ Classic Pneumatonometer is very effective in serial tonometry. Endoscopic Laser technologies provide surgical treatment of the ciliary processes under direct visualization, which is particularly useful for the management of glaucoma in cataract patients. Complementary devices include Wet-Field® diathermy products, Accu-Temp® cauteries, Merocel®, fluid control devices, and Ocutek™ specialty instruments.

Medtronic Ophthalmics, 6743 Southpoint Drive N, Jacksonville, FL 32216, USA.
In US: Tel. 1 800 535 4646; Outside US: Tel. 1 904 332 8864.
Website: www.medtronicophthalmics.com

Merck Sharp & Dohme

Merck Sharp & Dohme is a global research-driven pharmaceutical company dedicated to putting patients

first. Established in 1891, MSD discovers, develops, manufactures, and markets medicines and vaccines in more than 20 therapeutic categories. The mission of Merck Sharp & Dohme is to provide society with innovative products and services that improve the quality of life. Two such products are TRUSOPT™, which was the first in a new class of topical glaucoma therapy since beta-blockers, and COSOPT™, which is already used in more than 60 million patient-months of therapy worldwide.
The company also devotes extensive efforts to increase access to medicines through far-reaching programs that not only donate MSD medicines but help deliver them to the people who need them. For example, since 1987 the MECTIZAN™ Donation Program to combat river blindness has been the largest, ongoing, medical donation program in history, donating more than 1 billion tablets, providing hope for the elimination of onchocerciasis by the end of the decade.

For over 45 years, MSD has shown a commitment to eye health research.
CST-2005-W-136271-ES

MERCK, SHARP & DOHME, One Merck Drive, P.O. Box 100, Whitehouse Station, NJ 08889-0100, USA.
Tel: +1 908.423.1000 Fax: +1 908.735.1122
Website: www.mercksharpdohme.com

Ocular Surgery News Europe/Asia-Pacific Edition.
SLACK Incorporated, delivering the best in health care information and education worldwide, invites you to booth # 13. Get your complimentary issue of Ocular Surgery News Europe/Asia-Pacific Edition. Delivered monthly to over 30,000 ophthalmologists in 24 countries, this publication features timely reports on meetings and breaking news. Visit OSNSuperSite.com – Eye Care's Only Daily News Source, now with more that 11,000 searchable documents online.

Ocular Surgery News Europe/Asia-Pacific Edition.
SLACK Incorporated, delivering the best in health care information and education worldwide, invites you to booth # 13. Get your complimentary issue of Ocular Surgery News Europe/Asia-Pacific Edition. Delivered monthly to over 30,000 ophthalmologists in 24 countries, this publication features timely reports on meetings and breaking news. Visit OSNSuperSite.com – Eye Care's Only Daily News Source, now with more that 11,000 searchable documents online.

Oculus Optikgeräte GmbH
OCULUS was founded in Berlin in 1895. In 1947, the family-owned company moved to Wetzlar (60 kms north of Frankfurt), one of the centers of the optical and fine-mechanical industry in Germany.
Today, approx. 170 persons are working in R&D, production, distribution and service of diagnostic instruments for ophthalmologists.
Within the last few years the company has changed its profile and introduced innovative versions of traditional products:
PENTACAM: Rotating Scheimpflug camera, offering also densitometry, anterior chamber analysis, corneal topography, pachymetry. Comprehensive diagnostic tool for Glaucoma screening, corneal surgery and lens implantation.
PACHYCAM: Non-contact slit-lamp mounted Pachymeter with integrated keratometer.
TWINFIELD: Automatic static and kinetic full-field perimetry acc. to Goldmann. The new projection-system allows also manual kinetic perimetry, color-perimetry and a stimulus absolutely equal in shape and brightness.
CENTERFIELD: This compact central-field screener uses the technology of the Twinfield and comes with color and kinetic perimetry and with fixation-shift for a 70°-field.
CLIP: This exciting fast threshold strategy combines speed and reproducible precision. Available for Twinfield and Centerfield.
EASYFIELD: This screener-sized 30 degree-perimeter, is designed for quick perimetry. Screening and threshold strategies and 30-2 grid allow full perimeter-compatibility. The hand-control-unit includes printer, storage capability for 40,000 examinations and PC-interface.

OCULUS OPTIKGERÄTE GmbH, Dutenhofen, Münchholzhäuser Strasse 29,
D-35549 Wetzlar, Germany.
Contact: Harald Schick; Tel: +49-641-2005-0; Fax: +49-641-2005-295 ; E-mail:export@oculus.de

Ophthalmology Times
The Ophthalmology Times Group is comprised of Ophthalmology Times, Ophthalmology Times International, Ophthalmology Times China, Ophthalmology Times India, OphthalmologyTimes.com, and Ophthal-

mology Times Medical Education. Published 24 times per year, Ophthalmology Times is the leading physician-reviewed news magazine in the ophthalmic market, delivering a well-rounded package of surgical and clinical news, industry trends, insights, and discoveries in all specialties.

Ophthalmology Times, 485 Route 1 South, Bldg. F, First Floor, Iselin, NJ 08830, USA. Contact Person: Lauri Jorgensen; Tel:+1-732-346-3013; Fax: +1-732-596-0003; E-mail: ljorgensen@advanstar.com Website: www.OphthalmologyTimes.com

Optonol AG

The Ex-PRESS™ is a miniature glaucoma implant that provides a simplified method of filtration surgery for patients with open angle glaucoma. The Ex-PRESS™ implanted under a Scleral Flap is a minimally invasive reproducible procedure that requires no iridectomy and no scleral tissue removal.

Product category: Glaucoma pressure regulators/devices

OPTONOL AG, Bundesstrasse 5, P.O.Box 1142, CH-6301, Zug, Switzerland.
Tel: +41-41 727 2270; Fax: +41-41 727 2273 ; E-mail: remi@optonol.ch
Website: www.optonol.com

Pfizer

Pfizer Ophthalmics is dedicated to preserving sight and eliminating preventable blindness through a commitment to innovation and partnerships. For example, Pfizer's commitment to the WHO's International Trachoma Initiative is providing 135 million treatments over the next five years.
Our goal is to become the most valued partner in ophthalmics by developing breakthrough medicines, supporting healthcare professionals and their patients, and pursuing progress with an unwavering commitment to leadership and integrity.
Please visit the Pfizer exhibit to hear more about Xalatan® (latanoprost) and Xalacom® (latanoprost/timolol maleate).

Pfizer Ltd, 235 East 42nd Street, New York, NY 10017, USA.
Tel: +1 212-733-2323; Website: www.pfizer.com

Ryazan State Instrument-Making Enterprise

Ryazan State Instrument-Making Enterprise (GRPZ) is one of the largest and dynamically developing Russian enterprises, which possesses the powerful instrumental basis and unique technologies. The enterprise is certificated according to the demands of international quality system ISO 9001. One of the main areas of activity is manufacturing of medical equipment. For ophthalmology GRPZ offers the unique «diaton» tonometer that makes it possible to carry out intraocular pressure measuring through the eyelid excluding direct contact with the eye mucous membrane.
The advantages of the device are:

- no contact with the cornea
- no anesthesia
- possibility of diagnose glaucoma at any stage
- measuring of IOP in patients after corneal surgeries
- screening examinations of the patients
- IOP measuring in the presence in a patient of chronical conjunctivitis, erosions, edema and cornea dimness
- IOP measuring during contact correction.

The unique methodology of intraocular pressure measuring through the eyelid applied in the device provides new resources in ophthalmotonometry, simplicity and safety of tests.
Method for measuring the intraocular pressure through the eyelid and device for realizing the same are protected with the Patent of Russia No. 2123798, United States Patent No. US 6,394,954 B1 and Patent of Japan No. 3593314.

Santen

Santen is a multinational ophthalmic pharmaceutical company founded in Osaka, Japan in 1890 specializing in treatments for eye diseases, offering both prescription and OTC products. Among prescription ophthalmic pharmaceuticals, Santen holds the top share within the Japanese market and is one of the leading ophthalmic companies worldwide.

The desire to contribute to the quality of life of people not only in Japan, but also around the world, encouraged Santen to begin in developing its worldwide presence in the 1990's. Santen has subsidiaries in the U.S., Europe and Asia and is actively pursuing technological and marketing alliances with a number of pharmaceutical companies and research institutes.

Santen, Niittyhaankatu 20, PO Box 33, FIN-33721 Tampere, Finland.
Tel: +358-3-284 8111; Fax: +358-3-318 1900; E-mail: tuomas.huuhtanen@santen.fi
Website www.santen.com

SOLX, Inc

SOLX, Inc. is sharing its vision of a new glaucoma treatment system The DeepLight® Glaucoma Treatment System is the first of its kind to combine a Titanium Sapphire 790 nm laser with a photo-titratable gold micro-shunt to provide physicians the widest range of intraocular pressure (IOP) reduction options possible. The system is in development and limited by United States law to investigational use only.Based at the Boston University Photonics Center in Boston, Massachusetts, SOLX is a privately held company developing new approaches to glaucoma treatment. More information can be found online at www.SOLX.com.

STAAR Surgical AG

STAAR Surgical is manufacturer of the AquaFlow™ Collagen Glaucoma Drainage Device. The implant made of collagen is 4 mm in length and 0.5 mm in diameter. It is intended for patients diagnosed with open angle glaucoma and used in combination with non-penetrating deep sclerectomy under local or topical anesthesia. The AquaFlow™ maintains a sub-scleral space, preventing fibrosis and scarring. The implant is covered by a monolayer of fibronectin within 27 days of surgery and gradually resorbed over a six to nine month period. Results over eight years show that deep sclerectomy with collagen implant provides stable longterm control of IOP.
STAAR Surgical is also developing, manufacturing and globally distributing intraocular lenses for use in cataract and refractive surgery, including the Implantable Contact Lens ICL™ for myopia, hyperopia and myopia with astigmatism, and the worlds first preloaded IOL Injection System KS-3, soon to be marketed with an aspheric lens.

STAAR Surgical AG, Hauptstrasse 104, CH-2560 Nidau, Switzerland.
Phone +41 32 332 88 88; Fax +41 32 332 88 99; E-mail: info@staarag.ch
Website: www.staar.com

Talia Technology

Talia Technology, founded in 1991, develops and markets ophthalmic imaging devices for the screening, diagnosis and follow-up treatment of the most common retinal diseases and pathologies such as Glaucoma, Diabetic Retinopathy and AMD. Talia's flagship is the RTA Talia hold its headquarters in Israel and has two fully owned subsidiaries in Germany and the US.
What is the RTA?
The RTA is an all-in one modular ophthalmic imaging system offering a wide range of diagnostic solutions. This single instrument provides retina and disc diagnostics, thickness and topography analysis, fundus imaging, 3D interactive imaging and more. The RTA can be used for screening, diagnosis and reliable follow-up of Glaucoma, DME, AMD and retinal pathologies such as macular holes.

Wisepress Online Bookshop

Wisepress Online Bookshop is pleased to present a display of publications chosen especially for WGC 2005 from the world's leading publishing houses. All the books on display can be ordered/bought directly at the stand or via our website. We can also order you free sample copies of the journals on display and take subscription orders. Whatever your book requirements, Wisepress will be happy to help - whether you are an author seeking a publisher or having difficulty obtaining a title, our professional staff will assist you.

Wisepress Online Bookshop, The Old Lamp Works, 25 High Path, Merton Abbey
London SW19 2JL, UK. Tel. 00 44 (0)208 715 1812; Fax. 00 44 (0)208 715 1722;
E-mail: Bookshop@wisepress.co.uk Website: www.wisepress.co.uk
Contact: Nadia Ahmed, Bookshop Manager

Ziemer Ophthalmic Systems of Switzerland

A family enterprise dedicated to Ophthalmology since 35 years; providing leading edge, award-winning technologies for improved surgical outcomes and superior diagnostic results; enabling Ophthalmologists and Optometrists to deliver better vision care to their patients.
Ziemer Ophthalmic Systems is a Switzerland-based group of companies who engage in research, engineering, production, and worldwide marketing of high-tech products for the ophthalmic market. The Group serves key markets such as Glaucoma, Refractive, and Cataract, delivering leading specialty products for surgical and diagnostic applications. Products include the AMADEUS II"! microkeratome (manufactured by SIS Surgical Instrument Systems, a Ziemer Ophthalmic Systems Group Company, for AMO Advanced Medical Optics), the PASCAL® Dynamic Contour Tonometer (manufactured by SMT Swiss Microtechnology AG, a Ziemer Ophthalmic Systems Group Company), and the SwissBlade series of steel and diamond cataract knives. Further major product introductions are planned for the current year. All products (with the exception of the AMADEUS microkeratome) are marketed by Ziemer Ophthalmic Systems AG, headquartered in Port (Switzerland), its subsidiary Ziemer Ophthalmic Systems USA (Tampa, Florida), and its worldwide network of specialized distributors.

Ziemer Ophthalmic Systems AG, Dr. Anton C. Wirthlin, CEO, CH-2562 Port, Switzerland. Phone: +41 32 332 7052; mail: anton.wirthlin@ziemer-ophthalmics.com
Ted Newill, Ziemer Ophthalmic Systems USA, 33702 Tampa, FL, USA. Phone: +1 (727) 525 2881;
E-mail: Ted.Newill@ziemer-ophthalmics.com
Website: www.ziemer-ophthalmics.com

3W Informed

Our medical bookshop 3W Informed has over 15 years experience with medical books and multimedia. Nowadays, our database contains more than 1,250,000 titles. At this congress we will sell books, CD-Roms, PDA's and journals about Glaucoma.

For more information, please visit our website www.3w-informed.com

To eat our cake and have it, to lose our sole and save it, to enjoy the physical privileges of selfishness and the moral luxury of altruism at the same time, would be the ideal. But the real offers us htese terms in the shape of mutually exclusive alternatives of which only one can be true at once; so that we must choose, and in choosing murder one possibility.

William James


ausgen. Radfahrer
Fiaker, Taxi,
Linienomnibusse,
Fzge des öffentl.
Sicherheitsdienstes,
Straßendienst u.
Müllsammelfzge

TABBLAD ADVERTENTIE PFIZER

KEERZIJDE TABBLAD

GENERAL MEETING INFORMATION


Berlitz

Venue

Neue Messe Wien
Messeplatz 1
A-1021 Wien
Tel: +43 (0)1 727 20-0
Fax: +43 (0)1 727 20-443
www.messe.at

Congress Organizer

AIGS Meeting Office
Jan van Goyenkade 11, 1075 HP
Amsterdam,
The Netherlands
Tel.: +31 20 679 3411
Fax: +31 20 673 7306
E-mail: aigs@eurocongres.com

Local Organizer

(Hotel accommodation, tours and partner program)
Austropa Interconvention
Austrian Travel Agency Corp.
Friedrichstrasse 7
A-1010 Vienna, Austria
Tel: +43 1 588 00 – 513 and 514
Fax: +43 1 588 00 - 520
E-mail: aigs@interconvention.at

Offices

* Assocation of International World Glaucoma Societies
* International Glaucoma Review
  Booth # 20

Badges

All participants and accompanying persons will receive a personal badge upon registration. You are kindly requested to wear your name badge when attending any scientific session or social gathering. Only participants who are wearing their name badge will be admitted to the meeting rooms. You should also wear your badge in the Exhibition area.

Please note: accompanying persons and exhibitors will not be admitted to the scientific sessions. Accompanying persons do have free access to the exhibition.

Name badges have been colour-coded as follows:

Red	Faculty
Blue	Delegates
Green	Accompanying persons
Yellow	Exhibitors
Purple	Press

The charge for replacement of lost badges will be € 15.

Banking Service, Cash Machine, Credit Cards.

The official currency in Austria is the Euro. Banks are usually open from Monday to Friday 8 a.m. to 12.30 p.m. and 1.30 p.m. to 3 p.m., on Thursday until 5.30 p.m.
A Cash Machine is located outside the entrance of Hall D of the Congress Centre.
Most hotels, restaurants and shops accept international credit cards.

Business Center

The 'Print Shop' is situated in the Mall and will be open during congress hours. The Print Shop provides services like photocopying, faxing, producing business cards, the sales of pens, paper, envelopes, etc.

Coat and Luggage

A coat and luggage check area will be available in the basement under Foyer A.
There is a charge of € 1.- per item.

Coffee and Tea

Coffee and tea is available at various catering points throughout the Congress Centre.

Dress code

Meeting: casual or business casual.
Welcome Reception: business, tenue de ville.
Imperial Viennese Glaucoma Ball: dark suit and tie, smoking (black tie). You may also go for the official dress for Viennese balls: tails (white tie); women: elegant evening dress or long skirt will do. Traditional evening dress of your country is highly appreciated.
Farewell Party: business, tenue de ville.

Electricity

220 V, with 50 Hz frequency

Evening Dress Rental

Lambert Hofer Kostüme, Simmeringer Hauptstrasse 28, A-1110 Wien. Tel. (1) 740 90

Hotel Reservations

For Hotel reservations please contact Austropa Interconvention at the Hotel Desk in the Registration Area in Hall A.

Map of Vienna

A pop-up Vienna City Map is included in your congress bag. This map is presented to you courtesy of Alcon Laboratories, Inc.

Insurance, Liabilities

Neither AIGS, nor the Organizers can be held responsible for any personal injury, loss, damage, accident to private property or additional expenses incurred as a result of delays or changes in air, rail, sea, road or other services, strikes, sickness, weather, acts of terrorism and any other cause. All participants are encouraged to make their own arrangements for health and travel insurance.

Internet Access

Internet Corners are available in the Registration Area and in the Congress Centre (see floorplan). Supported by an unrestricted educational grant by Pfizer.

Lunch

Lunch is available at various catering points throughout the Congress Centre at a cost. Lunch boxes will be provided by the midday Symposium organizers.

Message Desk

At the message desk delegates can leave or collect messages. The desk is located in the Registration Area.

Program Changes

Actual program changes will be indicated on the message boards located throughout the congress centre.

The organizers cannot assume liability for any changes in the program due to external or unforeseen circumstances.

Restaurant Guide

Our Host, the Austrian Glaucoma Society, has prepared a personal Restaurant Guide under the leadership of Dr. Tony Hommer. Restaurants in Vienna offer a variety of high quality lunches and dinners. The city is one of Europe's premier culinary centres. The Restaurant Guide will lead you to the places our local colleagues know and appreciate. The Guide is presented to your courtesy of Croma and is included in your congress bag.

Shirts, buttons, and all the additional things

Wäscheflott, Augustinerstrasse 7, A-1010 Wien. Tel. (1) 533 5084
Zum Jockey Club, Tegetthoffstrasse 7, A-1010 Wien. Tel. (1) 512 5911

Shopping

Shops are open on weekdays from 9 a.m. - 6 p.m. (some until 8 p.m. on Thursday or Friday); on Saturdays: 9 a.m. to 1 p.m.; larger shops and malls are open until 5 p.m. on Saturdays. Shops are closed on Sundays.

Tipping

Usually tips are included in all fees, however a tip of approximately 10% at restaurants will always be appreciated if the service was at your satisfaction.

REGISTRATION / TICKETS

Registration desk – opening hours:

Wednesday July 6	8.00 a.m. – 6.00 p.m.
Thursday, July 7	7.00 a.m. – 6.00 p.m.
Friday, July 8	7.00 a.m. – 6.00 p.m.
Saturday, July 9	8.00 a.m. – 5.30 p.m.

On-site Registration fees
(prices are exclusive of 20% VAT)
Participants: € 725.-*
Residents: € 250.-*/**
Accompanying persons: € 200.-***

Certificate of Attendance

Certificates of Attendance will be available at the Registration Desk in the Registration Area as of Friday July 8, 14.00 hours.

Courses (included in registration fee)

Courses tickets are available for registration on-site on a first come first served basis. Tickets can be obtained at the Course/Meet the Expert Desk in the Registration Area in Hall A.

Meet the Expert Breakfast Table Discussions (included in registration fee)

Tickets for Meet the Expert Breakfast Tables can only be booked on-site on a first come first served basis. Tickets can be obtained at the Course/Meet the Expert Desk in the Registration Area in Hall A. Continental breakfast will be provided.

Social Program

A limited number of tickets is available on-site for the : Imperial Viennese Glaucoma Ball (July 8): € 60,- including VAT and the Farewell Party (July 9), included in the registration fee for participants and accompanying persons. Tickets can be obtained at the Registration Desk in Hall A

* The fee for participants and residents covers: admission to all scientific sessions, courses, meet the expert breakfast tables, congress bag, program and abstract book, and invitations to the Welcome Reception and Farewell Party.
*** To qualify for the resident registration fee, the applicant's registration form must be signed by the head of the relevant university/institute department and stamped with the university's/institute's official stamp.*
*** The fee for accompanying persons includes: registration for one half-day tour, 'Historical Vienna, and one full day tour, 'Romantic Danube Valley', a public transport ticket and invitations to the Welcome Reception and the Farewell Party.

Transportation

Getting from the City Centre to the Airport

Buses		every	from	to	Rates
Schwedenplatz	Airport	30 minutes	5.00 a.m.	11.30 p.m.	€ 6
Hotel Country Inn & Suites Hotel Crown Plaza Vienna Uno City	Airport	90 minutes	6.25 a.m.	07.55 p.m.	€ 6
Westbahnhof railway station Südtiroler Platz Südbahnhof railway station	Airport	30 minutes	5.00 a.m. 5.10 a.m. 5.15 a.m.	11.00 p.m.	€ 6
City Airport Train (CAT)					
Wien Mitte railway station	Airport	30 minutes	5.37 a.m.	11.07 p.m.	€ 9
S-Bahn (Rapid Train) – S7					
Wien Floridsdorf Wien Nord Wien Mitte Wien Rennweg	Airport	30 mintues	4.20 a.m. 4.27 a.m. 4.32 a.m. 4.34 a.m.	09.44 p.m.	€ 3
Taxi					
city centre	Airport				€ 35

Shuttles from Hotels to Congress Center

A shuttle service from a number of fixed meeting points to the Congress Centre and vice versa is provided in the morning before the congress starts and in the afternoon after the meeting according to the following schedule.

Departure Times: Schwedenplatz—> Messe

Wednesday, July 6, 2005: 08.00, 08.30, 09.00, 09.30, 10.00, 10.30, 11.00, 11.30, 12.00, 12.30, 13.00.
Thursday, July 7, 2005: 06.45, 07.00, 08.00, 08.30.
Friday, July 8, 2005: 06.45, 07.00, 08.00, 08.30.
Saturday, July 9, 2005: 08.00, 08.30, 09.00.

Departure Times: Messe—> Schwedenplatz

Wednesday, July 6, 2005: 17.45, 18.15.

Thursday, July 7, 2005: 18.15, 18.45.
Friday, July 8, 2005: 18.15, 18.45.
Saturday, July 9, 2005: 17.45, 18.15.

Departure Times: Stadtpark (Hilton)—> Messe

Wednesday, July 6, 2005: 08.00, 08.30, 09.00, 09.30, 10.00, 10.30, 11.00, 11.30, 12.00, 12.30, 13.00.
Thursday, July 7, 2005: 06.45, 07.00, 08.00, 08.30.
Friday, July 8, 2005: 06.45, 07.00, 08.00, 08.30.
Saturday, July 9, 2005: 08.00, 08.30, 09.00.

Departure Times: Messe—> Stadtpark (Hilton)

Wednesday, July 6, 2005: 17.45, 18.15.

Thursday, July 7, 2005: 18.15, 18.45.
Friday, July 8, 2005: 18.15, 18.45.
Saturday, July 9, 2005: 17.45, 18.15.

Departure Times: Albertina—> Messe

Wednesday, July 6, 2005: 08.00, 08.30, 09.00, 09.30, 10.00, 10.30, 11.00, 11.30, 12.00, 12.30, 13.00.
Thursday, July 7, 2005: 06.45, 07.00, 08.00, 08.30.
Friday, July 8, 2005: 06.45, 07.00, 08.00, 08.30.
Saturday, July 9, 2005: 08.00, 08.30, 09.00.

Departure Times: Messe—> Albertina

Wednesday, July 6, 2005: 17.45, 18.15.

Thursday, July 7, 2005: 18.15, 18.45.
Friday, July 8, 2005: 18.15, 18.45.
Saturday, July 9, 2005: 17.45, 18.15.

Public Transport Vienna boasts a modern, efficient public transport system consisting of tramways, underground railway (U-Bahn) and buses. Almost all hotels have easy access to the public transportation system. Tickets are sold at dispensers, ticket counters at major subway stations and in tobacco kiosks (TABAK). A weekly ticket, valid on all train, bus, tram and subway lines within Vienna, costs € 12.50; a single-ride ticket € 1.50

To travel to the Neue Messe Vienna:

- take the underground line U1, Praterstern stop, and then the tram 21, direction Praterkai, Messeplatz stop or
- the underground line U1, Vorgartenstraße stop, and then the bus 11a, Elderschplatz stop

Weekly tickets can also be ordered at the Social Desk.

Tours

* **Tours included in the registration fee for accompanying persons**

Accompanying persons will find a ticket for these tours in their registration package.

* **Optional tours**

To book optional tours please contact Austropa at their Desk in the Registration Area.

Vienna

The Inner City

Rising from Vienna's old city centre, just beyond where the stone walls of the Roman camp once stood, the predominantly Gothic **Stephansdom** (St. Stephan's

Cathedral) continues to tower over the hearts and minds of the Viennese as it has for some 800 years. Known affectionately as Der alte Steffl (Old Steve) by the Viennese, it blends the styles of many ages into a unique and harmonious whole. Its colourful tiled roof depicts the two-headed Habsburg eagle bearing the imperial crown and the order of the Golden Fleece.

See for more extensive information www.info.wien.at.

Radiating away from the Stephansdom are a number of little streets as intricately connected as the threads of a spider's web. And within the web, more churches, museums, palaces, boutiques, galleries, antique shops, coffeehouses, sidewalk cafes, and restaurants await the visitor. It doesn't really matter which direction you choose to walk when wandering about. The old Inner City holds endless delights.

The Ring

Encircling the Inner City is a broad boulevard, called the Ring. It replaced the city fortifications that were torn down in the mid-nineteenth century by order of Franz Joseph I, the Habsburg emperor who ruled from 1848 to 1916.

Amongst the treasures lining the Ring is the **State Opera House**. For many Viennese, the soul of Vienna resides within its elegant interior. The opera in Vienna is reasonably egalitarian. There's a ticket price to fit everyone's pocket, because the Viennese love of music is not class-bound. What matters to the Viennese is the quality of the performance.

There are innumerable museums in Vienna. But the greatest of them all is the **Kunsthistorisches Museum (the Museum of Fine Arts)**, located further down the Ring. Its massive collections include a wealth of art by Rembrandt, Raphael, Bosch, Titian, Rubens, and Vermeer, as well as the largest collection of Pieter Bruegel in the world. And competing with the richness of its art, the intricately designed marble halls of the museum are quite breathtaking.

Facing the Kunsthistorisches Museum is the **Naturhistorisches Museum (Natural History Museum),** chock-full of curiosities. Its collections were started by Maria Theresia's husband, Franz Stephan von Lothringen, and enlarged by their successors. Dinosaur skeletons, stuffed mammals, birds, and fish, minerals, one of the oldest prehistoric sculptures in the world, the Venus of Willendorf, and unique painted skulls from Hallstatt graves, are amongst it treasures.

Between the two museums is the commanding memorial to the eighteenth-century Habsburg ruler Maria Theresia, who sits high on her throne surrounded by her ministers and generals. In addition to being the only

female ruler (and one of the most successful) in the history of the House of Habsburg, Maria Theresia bore sixteen children.

Across the street, the spacious grounds of Heldenplatz lead to the ***Hofburg***, formerly the imperial palace. Today, this magnificent open space reveals many of the splendid public buildings and gardens lining the Ring and contributes to the overall beauty of this boulevard, enhanced in spring by its many flowering lilac bushes.

The Viennese Imperial Ball will be held in the Hofburg (see front cover)

The mixture of styles along the Ring blends into a surprisingly harmonious study of European architectural history, ranging from the neo-Grecian style Parliament to the neo-Gothic ***Rathaus*** (city hall), the neo-Renaissance Burg Theater to the neo-Baroque Imperial Palace, enhanced by the elegance of the formal gardens of the Burggarten and the Volksgarten.

The opening ceremony is taking place in the Rathaus

The Palaces

The Hofburg, just inside the Inner Ring, was started in 1279 and eventually became the imperial residence of the Habsburgs. Franz Joseph I, a resident for 86 years, slept on a spartan iron bedstead in his luxuriously appointed apartment as did his wife, the very elegant and beautiful Empress Elizabeth, affectionately known as Sisi by the Viennese.
Franz Joseph ruled for 68 years. Accompanying his spartan tastes in comfort was an equally spartan attitude towards food. The etiquette of the day dictated that courses end once the emperor had finished eating. At large banquets, many guests had hardly been served their first course by the time Franz Joseph had finished his last. A tradition arose for guests to retire to the nearby **Hotel Sacher** for dinner, after 'dinner'. The Hotel Sacher still serves the world famous Sachertorte (a chocolate cake layered with apricot jam) created there.

Sisi herself was quite ahead of her time in staying fit. Each morning at 5 a.m. she bathed in cold water in a copper bathtub. She was an excellent horsewoman and designed and followed her own personal fitness training regime which included gymnastics on a wooden ladder and rings, which are on display in her former rooms. She retained her remarkably small waist throughout her life which was ended by an assassin's file.

The Hofburg also houses the Schatzkammer (Imperial Treasury) containing an abundance of treasures from the past. The thousand year old bejeweled crown of the Holy Roman Empire is on display here, as well as other imperial insignia. Truly astonishing are the relics on display in the Ecclesiastical Treasury. Amongst its treasures is the Holy Lance, which is reputed to have pierced the side of the Lord and thus bathed in His blood. There are several thorns from Christ's Crown of Thorns, particles of the True Cross, one of which has a nail hole thought to have soaked up His blood, hairs from His beard, droplets of His blood, a piece of His shroud, and the nail that pinned Christ's right hand to the Cross. St. Stephan's purse is said to have contained his blood, another reliquary contains one of St. Peter's molars, another a fragment of the Virgin Mary's veil. All together, the Schatzkammer is one of the finest treasuries in Europe.

Next to the Treasury is the **Burgkapelle** (the Imperial Chapel), where the **Wiener Sänger Knaben** (***Vienna Boys Choir)*** sing during Sunday morning mass. The origin of the Vienna Boys Choir goes back to the fifteenth century. Today, 150 boys receive music training and general instruction in the Augarten Palace. The boys form several choirs and they perform all over the world.

Outside the Ring

Now it's time to venture a bit farther outside the Ring to visit the Upper and Lower **Belvedere Palaces**, and the gardens in between. Eugene of Savoy was a French prince, who served the Habsburgs and defeated both the French and the Turks in the seventeenth century. Initially, he had offered his services to his own king, but was turned down because he was too short. But in spite of his diminutive size, Prince Eugene saved the day for the Habsburgs several times and was richly rewarded. He used his proceeds well, building these fabulous palaces and collecting art and furnishings to fill them.

But your sightseeing pleasures aren't over yet. The very Baroque **Schönbrunn** Palace was the summer residence of the Habsburgs. Although Baroque on the outside, the style inside is mostly Rococo. Maria Theresia, who ruled for forty years in the eighteenth century, provided the funds for the Rococo finishing touches. Schönbrunn is a grand palace, designed with Versailles in mind. Wolfgang Amadeus Mozart entertained Maria Theresia and her family and guests here at the age of six. Legend has it that Mozart declared his love for Princess Marie Antoinette, Maria Theresia's daughter, who was seven years old at the time.

Like the Belvedere, the Schönbrunn palace is a must-see site. Forty-five of the 1,141 rooms in the palace are open to the public. The court architect and designer, Johann Fischer von Erlach, included 139 kitchens in his plans, but not even the emperor had a private bathroom.

But don't limit yourself to just a walk around the inside of the palace, the extensive gardens outside are exceptional. They were laid out in the formal eighteenth-century French manner. High on the hill in front of you as you leave the palace, stands the delightful Gloriette. Originally, the palace itself was to be built there, but, unfortunately, the high costs involved caused a change of plans.

TABBLAD ADVERTENTIE PFIZER


AIGS

THE ASSOCIATION OF INTERNATIONAL GLAUCOMA SOCIETIES
THE GLOBAL GLAUCOMA NETWORK

That blessed mood
In which the burthen of the mystery,
In which the heavy and the weary weight
Of all this intelligible world,
Is lightened: that serene and blessed mood
In which the affections gently lead us on, -
Until, the breath of this corporeal frame
And even the motion of our human blood
Almost suspended, we are laid asleep
In body, and become a living soul:
While, with an eye made quiet by the power
Of harmony, and the deep power of joy,
We see into the life of things

Wordsworth

The AIGS is an independent, impartial, ethical, global organization for glaucoma science and care.

Mission

To optimize the quality of glaucoma science and care through communication and cooperation among international Glaucoma Societies, with Glaucoma Industries, Glaucoma Patient Organizations and all others in the glaucoma community.

Vision

Curiosity, creativity, quality and integrity are essential ingredients for science and care.

The AIGS is the first global subspeciality effort involving all stakeholders: ophthalmologists, other eye specialists, industrialists and patients.

Goals

Unite, communicate, meet, create personal contact, support, inform, guide, educate, investigate, aim for quality.

Glaucoma Societies

We present here only the names of the Glaucoma Societies. For further information the reader is referred to:
1. The Glaucoma Society Posters (see below).
2. The Global AIGS Glaucoma Society Directory (see below).

A. Member Regional Glaucoma Societies

American Glaucoma Society - AGS
Australia and New Zealand Glaucoma Club - ANZGC
Asia Oceanic Glaucoma Society - AOGS
Canadian Glaucoma Society - CanGS
Chinese Glaucoma Society - ChinGS
European Glaucoma Society - EGS
Glaucoma Society of India - GSI
Glaucoma Society of the International Congress of Ophthalmology - GSICO
International Society of Glaucoma Surgery - ISGS
Japanese Glaucoma Society - JGS
Latin America Glaucoma Society - LAGS
Optometric Glaucoma Society - OGS
Pan Arab African Glaucoma Society - PAAGS
Pan American Glaucoma Society - PAGS
South African Glaucoma Society - SAGS
South East Asia Glaucoma Interest Group - SEAGIG

B. National Glaucoma Societies

Argentinean Glaucoma Society
Austrian Glaucoma Society
Azerbaijani Glaucoma Society
Belgium Glaucoma Society
Brazilian Glaucoma Society
Bulgarian Glaucoma Society
Central American Glaucoma Society
Chilean Glaucoma Society
Colombian Glaucoma Society
Croatian Glaucoma Society
Czech Glaucoma Society
Danish Glaucoma Society
Egyptian Glaucoma Society
Finnish Glaucoma Society
French Glaucoma Society
German Glaucoma Society
Ghana Glaucoma Association
Glaucoma Society UK and Ireland
Greek Glaucoma Society
Hungarian Glaucoma Society
Iceland Glaucoma Section of the IOS
Indonesian Glaucoma Society
Israeli Glaucoma Society
Italian Glaucoma Society
Korean Glaucoma Society
Lesotho Glaucoma Society
Lithuanian Glaucoma Society
Mexican Glaucoma Society
Netherlands Glaucoma Group
Nigerian Glaucoma Society
Norwegian Glaucoma Society
Philippine Glaucoma Society
Polish Glaucoma Society
Portuguese Glaucoma Society
Rumanian Glaucoma Society
Russian Glaucoma Society
Serbia & Montenegro Glaucoma Society
Slovenian Glaucoma Society
Spanish Glaucoma Society
Swedish Glaucoma Society
Swiss Glaucoma Society
Taiwanese Glaucoma Society
Thai Glaucoma Society
Turkish Glaucoma Society
Ukrainian Glaucoma Society
Zimbabwean Glaucoma Society

* Some Societies may call themselves sections of the national general ophthalmological society

Posters Glaucoma Societies
As this is the first time ever that all Glaucoma Societies of the world convene, the AIGS has asked each Glaucoma Society to present information on its structure on a Glaucoma Society Poster. These Glaucoma Society Structure posters can be visited in the Mall of the Conference Center and will be on from Wednesday July 6, noon till Saturday July 9, 5.00 PM.

Global AIGS Directory of Glaucoma Societies
The AIGS has identified 62 Glaucoma Societies and has compiled a Global AIGS Directory of Glaucoma Societies which includes basic information on the Glaucoma Society as far as available by June 1, 2005. This directory has been made available to the representatives of the Glaucoma Societies and to the AIGS Glaucoma Industry Members during the Inaugural Assembly Meeting. The Directory includes information on:

- Society Name (if regional society list partner societies and groups)
- Officers (+ Contact information)
- Administrator
- Headquarters Address
- Contact Information

The Directory can be obtained on request through the AIGS representative in the AIGS booth.

Glaucoma Industry Members of the AIGS

Glaucoma Industry Members
Alcon
Allergan
MSD
Novartis
Pfizer

Associate Glaucoma Industry Members
AMO
Carl Zeiss Meditec
Heidelberg Engineering
Haag Streit
Oculus Optikgeräte

Supporting Glaucoma Industry Members
Laserex/Ellex
Medtronic
Santen Japan
Senju
Ziemer Ophthalmic Systems

Global Glaucoma Patient Organization
At the initiative of the AIGS, a Global Glaucoma Patient Organization was founded in October 2004, New Orleans, LA, US. The aim of the organization is a further cooperation between national and regional Glaucoma Patient Organizations. Contacts between the GGPO and the AIGS are formalized through the AIGS GPO Liaison Committee. This committee will meet during the World Glaucoma Congress in Vienna.

Goals of the AIGS

- To further develop an effective world-wide organisation to realise common goals and improve standards for glaucoma management and research
- To facilitate and coordinate communication and collaboration between Glaucoma Societies, Glaucoma Industries and Glaucoma Patient Organizations and other organizations in the field
- To maintain and update an AIGS Global Code of Practice
- To maintain and update global guidelines for glaucoma diagnosis and treatment
- To maintain and update global guidelines on publication and reporting on glaucoma treatment
- To maintain and update global guidelines for the conduct of Glaucoma Meetings
- To present, classify and review information on glaucoma through International Glaucoma Review
- To improve the awareness of glaucoma
- To publish and update a Directory of Glaucoma Societies
- To stimulate and support Glaucoma Societies
- To create a forum for exchange on global glaucoma research, screening, prevention of Glaucoma Blindness and WHO relationships
- To organize global Consensus Meetings
- To organize Information and Planning Exchange Meetings
- To organize the Word Glaucoma Congress for all members of the AIGS

History
The AIGS officially started its activity on January 1, 2002 after extensive preparations in 2001. The first intercontinental cooperation started in the early nineties, when the American Glaucoma Society and the Japanese Glaucoma Society joined the European Glaucoma Society as supporters of IGR and organized combined meetings. In 2001 R.N. Weinreb and E.L. Greve developed the idea to create a global Association of Glaucoma Societies, starting with the then thirteen Glaucoma Societies involved in IGR. Roger Hitchings joined immediately and this triumvirate started to realize a dream. An essential aspect of the dream was to include everyone involved in glaucoma: Glaucoma Societies and Glaucoma Industries and Glaucoma Patient Organizations. The first Board of Governors consisted of R.A. Hitchings, R.N. Weinreb, E.L. Greve, Y. Kitazawa and R. Susanna. The first President was Roger Hitchings; Robert Weinreb became President Elect and Erik Greve who had just retired from University and had sufficient time and motivation for this huge job became the Executive Vice President. In the four and a half years of its existence the AIGS achieved the following:

AIGS achievements 2002-2003

- Global organization, network
- Global communication, IGR
- Cooperation with Glaucoma Industries
- Global Quality Standards
  - o Code of Practice
  - o Guidelines on Reporting and Publishing
  - o Guidelines on Quality for Glaucoma Meetings
  - o Guidelines on Glaucoma Society Organization
  - o Information and Planning Exchange Meetings
  - o Consensus Meeting on 'Structure and Function in the Management of Glaucoma'

AIGS achievements 2004

- Guidelines Reporting and Publishing now available online; evaluation in AIGS and other meetings.
- Guidelines on Quality of Glaucoma Meetings now available online; evaluation in AIGS and other meetings.
- Criteria for Glaucoma Society Organization now available online
- Global Guidelines on Diagnosis and Treatment in *statu nascendi*
- Report on Screening for Primary Open Angle Glaucoma started
- First Global AIGS Conference with representatives of Glaucoma ***Patient*** Organizations completed
- Final Announcement and call for papers AIGS World Glaucoma Congress 2005 out
- Six new Glaucoma Industry Members
- Book on first Global AIGS Consensus Meeting on Structure and Function published
- Preparations on second Global AIGS Consensus Meeting on Surgical Treatment of Open Angle Glaucoma

Achievements AIGS 2005

- Organization of second Consensus Meeting on Surgical Treatment of Open Angle Glaucoma
- World Glaucoma Congress

The AIGS considers the organization of the World Glaucoma Congress every two years as one of its priorities.

AIGS Committees

Executive Committee: R.N. Weinreb (president), R.A. Hitchings past president), E.L. Greve (executive vice president)

Board of Governors: M. Araie, I. Goldberg, E.L. Greve, R.A. Hitchings, Y. Kitazawa, R. Susanna, G.L. Skuta, R. Thomas, R.N. Weinreb

Advisory Board: P.J. Airaksinen, A. Alm, H. Almeida, D.R. Anderson, M. Aquino, A. Béchetoille, D. Epstein, J. Flammer, F. Gil-Carrasco, W.E. Gillies, A. Gonella, P.T. Hung, Y. Inoue, K. Iwata, P. Kaufman, G. Krieglstein, T. Krupin, R.P. LeBlanc, D.S. Minckler, S. Obstbaum, G. Spaeth, R.L. Stamper, M. Van Buskirk, D.H. Youn

Steering Committee: M. Araie, A.J. Bron, J. Cioffi, A.L. Coleman, R. Fechtner, S. Gandolfi, I. Goldberg, F. Grehn, E.L. Greve, H.D. Grigera, R. Hitchings, Y.J. Hong, Y. Kitazawa, R.A. Lewis, J.M. Liebmann, C. Migdal, R.A. Perez-Grossman, H. Quigley, R. Ritch, K. Singh, M.B. Shields, G. Skuta, R. Susanna, R. Thomas, C.E. Traverso, R.N. Weinreb

Glaucoma Society Representatives Committee: A. Ancker (SAGS), A. Brooks (ANZGC), F. El Sayyad (PAAGS), A. Euswas (AOGS), J. Ge (ChinGS), I. Goldberg (SEAGIG), A. Heijl (GSICO), T. Krupin (AGS), E. Maul (PAGS), H. Mishima (JGS), M.V. Patella (OGS), G.C. Parra (LAGS), P. Rafuse (CanGS), G.C .Sekhar (GSI), T. Shaarawy (ISGS), J. Thygesen (EGS)

Associate Advisory Board: T. Aung, A. Boehm, S. Chakrabarthi, J. Crowston, P. Foster, D. Friedman, C. Girkin, P. Healey, M. Honjo-Sawamura, K. Kashiwagi, K. Martin, F. Medeiros, A. Viswanathan

Glaucoma Patient Organization and Foundations Liaison Committee: P. Chew, I. Goldberg (co-chair), Y. Kitazawa, R. Ritch (co-chair), R. Susanna, J. Thygesen

Committee on Code of Practice: R.A. Hitchings (co-chair), Y. Kitazawa, R.A. Lewis (co-chair), R. Susanna, H.P. Pfleger (Allergan), M. Ypinga (Merck)

Committee on Guidelines for Reporting and Publishing: M. Araie, A.L. Coleman (co-chair), D.S. Friedman, S. Gandolfi (co-chair), E.L. Greve (ex officio), D.S. Minckler, T. Wells, R.P.L. Wormald (extended cie: J. Grunden (Pfizer), M. Ypinga (Merck), H.P. Pfleger (Allergan), R. Halprin (Alcon)

Committee on Guidelines on Quality and Quantity of Glaucoma Meetings: J. Airaksinen, W.L.M. Alward, D. Grigera, C. Migdal (co-chair), K. Singh (co-chair), G.L. Skuta, H. Tanihara, P. Taylor (Pfizer), G.Cagle (Alcon)

Committee on Guidelines for Diagnosis and Treatment of Glaucoma: H. Abe, I. Goldberg, J.M. Liebmann (co-chair), S. Obstbaum, G. Spaeth, R. Susanna, C. Traverso (co-chair)

Committee Global Research and Screening: A. Heijl (co-chair), H.A. Quigley (co-chair), M.R. Wilson (co-chair)

Subcommittee on Angle Closure Glaucoma: P.J. Foster, D.S. Friedman (co-chair), D. Lam, P. Rojanapongpun, S. Seah (co-chair), R. Thomas, N. Wang, J. Zhao

Subcommittee on Screening for Open Angle Glaucoma: D. Grigera, A. Heijl (co-chair), Y. Kuwayama, C. Leske, S. Miglior, T. Yamamoto, R.M. Wilson (co-chair)

Subcommittee on Cooperation with Medical Therapy: L. Cantor, D.S. Friedman, I. Goldberg, R.L. Gross, R.A. Hitchings (co-chair), Y. Kitazawa, S. Obstbaum, H.A. Quigley (co-chair), R. Halprin (Alcon), P. Taylor (Pfizer), M. Walt (Allergan), M. Ypinga (Merck)

Committee on Clinician Scientists: P. Khaw (co-chair), R.N. Weinreb (co-chair)

Committee on Glaucoma Society Organization: A. Azuara-Blanco (co-chair), R.D. Fechtner, W. Lelis-Barboza, J. Thygesen, R.P. Wilson (co-chair), T. Yamamoto

Membership AIGS

The AIGS is an association of Glaucoma Societies. It has no individual members. New or undiscovered Glaucoma Societies that desire to become a member of the AIGS are asked to contact the AIGS through GlobalAIGS@cs.com

The AIGS pursues the following relationship with her Glaucoma Societies:

- Cooperation and coordination on quality of glaucoma science and care
- Optimize communication
- Mutual support and learning
- Part of AIGS directory
- Coordinated calendar
- Meeting every two years at the World Glaucoma Congress
- Exchange of information through International Glaucoma Review, Consensus, Guidelines
- Global advocacy
- Review and coordination of Guidelines
- Website links
- Regular update from AIGS scientific committees
- Communal support in creating high level Glaucoma Society organization (*see* criteria for a Glaucoma Society)

National Glaucoma Societies will be represented in the AIGS by their regional Glaucoma Societies: EGS, AOGS, SEAGIG, LAGS, PAAGS, with the exception of JGS, SAGS, ANZGC, CanGS. The American Glaucoma Society, Chinese Glaucoma Society and the Glaucoma Society of India are considered Regional Societies (involving several states).

National Glaucoma Societies will meet every two years at the World Glaucoma Congress. In between, communication will be mostly through e-mail exchange.

Inaugural Assembly Meeting

This will be the first time ever that the world's Glaucoma Societies come together. Two representatives from the Executive Committee of each Glaucoma Society, representatives from the Glaucoma Industry Members and representatives from global Patient Organizations have been invited to this memorable event on Wednesday July 6, 10.30-12.00 in the Conference Center.

Agenda:

- Opening: R.N. Weinreb, President AIGS
- Goals of the AIGS: R.A. Hitchings, Past President AIGS
- History and Accomplishments: E.L. Greve, Executive Vice President AIGS
- Glaucoma Societies and Glaucoma Society Organization: R. Wilson, Co-chair Committee on Glaucoma Society Organization
- Introduction of Glaucoma Societies
- Guidelines for meetings: K. Singh, C. Migdal, Co-chairs Committee on Quality and Quantity of Glaucoma Meetings
- Glaucoma Patient Organization: R. Ritch, I. Goldberg, Co-chairs of Global AIGS Glaucoma Patient and Foundation Liaison Committee, Representatives of three Patient Organizations (President of Global Glaucoma Patient Organization, International Glaucoma Association, President of the Ghana Glaucoma Association)
- Discussion
  - How can more developed glaucoma societies support the advancement of less-developed glaucoma societies best?
  - How do we coordinate numerous and dissimilar glaucoma societies to more effectively pursue goals?
  - Are there other initiatives the AIGS should be pursuing?
- Interactive Questions on AIGS activities and cooperation.
- Closing

International Glaucoma Review – 20 years

IGR, which has been published since 1984, became the official journal of the AIGS in 2002. It is distributed to all members of the Member Regional Glaucoma Societies of the AIGS. The AIGS is investigating ways to also include all members of National Glaucoma Societies in the distribution.

IGR is a journal for glaucomatologists from all over the world. It aims at being a forum for the world's Glaucoma Societies.

IGR expects to provide:

1. Efficient and easy availability, three times per year,

of virtually all glaucoma literature world-wide, with a critical review of selected papers.
2. Increased awareness of the activities of fellow Glaucoma Societies by means of co-operation and reporting.

The uniqueness of IGR is its attempted completeness, its classification, and the Editor's Selection. IGR has the most complete collection of abstracts from the glaucoma literature which are otherwise not available, certainly not within the same time span. It is the only journal that presents a four-monthly critical review of selected glaucoma literature. Furthermore IGR contains announcements and reports from the Glaucoma Societies involved. It may also include complete selected papers, reports of meetings, interviews, opinions, hypotheses, reviews, and anything else considered to be of interest to the members of the Glaucoma Societies.

IGR online

All information in IGR (except the abstracts) is also available online. In addition IGR online provides information on Glaucoma Societies and additional reports. Webaddress: www.glaucom.com

GEM: the IGR glaucoma email announces upcoming online issues and communicates special news items to members of the glaucoma societies.

IGR is supported by a grant from the AIGS and advertising income.

History of IGR - an Editorial by Erik Greve which appeared in IGR volume 6, issue 1

International Glaucoma Review and its predecessor *Glaucoma Abstracts* have been serving the glaucoma interested community for 20 years. The first issue – much thinner than now with 62 pages – appeared in 1984. *Glaucoma Abstracts*, as the name was in these days, was an initiative of the European Glaucoma Society. The aim was and is to provide members of Glaucoma Societies with concise, classified information on glaucoma literature. It was sponsored by Chibret (Merck) who had the vision never to interfere with editorial matters. The first editorial, by the Honorary President of the EGS Professor Baron Jules François and myself as chief editors, has been reproduced at www.glaucom.com, the IGR website.

The EGS was soon joined by the American and Japanese Glaucoma Societies. The AGS in these days was represented by George Spaeth, Dick Simmons, Bruce Shields and Douglas Anderson. They made that important move together with Yoshi Kitazawa, representing the Japanese Glaucoma Society to join the EGS in an alliance that can be seen as a predecessor of the AIGS. This is the place to thank Bruce Shields and Yoshi Kitazawa for many years of editorial support for *International Glaucoma Review* (IGR). *Glaucoma Abstracts International* changed into *International Glaucoma Review* in 1998 and sponsorship was taken over by Pharmacia. IGR started serving all major regional Glaucoma Societies in the world, which was reflected in the members of the editorial board, particularly the Society Editors. With the foundation of the Association of International Glaucoma Societies (AIGS) in 2002, IGR became the journal of the AIGS and Robert Weinreb joined the board as editor.

The greatest joy for me after twenty years is the overwhelming enthusiasm with which IGR has been received over the years by my colleagues. Wherever I meet colleagues there are always several who spontaneously voice their appreciation for IGR as a quick, easily accessible source of top quality information on glaucoma literature and more. It has been a great experience to be able to work with the top experts in our subspecialty. My heartfelt gratitude goes to the editorial board and other reviewers. They create the quality of IGR. Robert Weinreb deserves a special thanks, because it was with him that I had the opportunity to create the last and essential changes: the transformation into the journal of the AIGS. Roger Hitchings was and is the other person who was instrumental in the transformation and has been the best successor as president of the EGS that I could dream of.

They have all helped me in various ways to get IGR where it is today: a highly appreciated source of information on glaucoma, on glaucoma societies, on glaucoma meetings supplemented with some wisdom, some poetry and some fun. That sounds like life.

AIGS-Award

The AIGS-Award is the only global glaucoma research award supported by all member Glaucoma Societies. The award was started in 1999.

Excerpt from the AIGS-Award Rules:

1.1 There will be two (2) awards per year for the purpose of stimulating creativity and originality and rewarding daring and breakthrough research in the field of glaucoma, to help protect the research time of junior researchers for the benefit of glaucoma patients. The award money is intended to be used for further research.

1.2 The AIGS-Awards will be presented to the two (2) best papers on glaucoma published in the scientific literature and reviewed by the IGR in each calendar year, starting from 1999.

1.3 Each AIGS-Award will consist of:

(a) a total amount of USD 25,000

(b) the AIGS-Award diploma; and

(c) the AIGS-Award Crystal Bowl

2. The Nomination Committee

2.1 The Nomination Committee will consist of the Society Editors, each representing their own Glaucoma Society, as well as five (5) members of the editorial board of IGR.

3. The Selection Committee

3.1 The Selection Committee will consist of seven (7) members. These members will consist of the Managing Editor and six (6) members of the editorial board of IGR who have not served on the nomination committee.

6. Selection Criteria

6.1 The AIGS-Award will be presented to the researcher who actually conceived the idea, and who has been actively involved in transforming his/her idea into the published results of a well-presented study. This does not necessarily have to be the first author of a publication. It could also be a senior co-author, if the selection committee has information that he/she is the major contributor to the paper. The Award may also be presented jointly to more authors. The Award will be presented independent of age, and it can be presented more than once to the same researcher.

6.2 Publications selected for the AIGS -Award shall:

– Contain clinical or pre-clinical research fundamentally related to glaucoma;

– Be published in a peer-reviewed journal; and

– Represent original, creative, daring, and breakthrough research work.

– Be published between January 1st and December 31st of the year in which the Award is presented.

7. The AIGS-Award Ceremony

7.1 The awardees will be invited to the Award ceremony.

7.2 The AIGS-Award ceremony will take place at a meeting of one of the Glaucoma Societies in the year following the year of publication.

AIGS-Award Winners 1999-2003

1999, London	Peng Khaw, Francesca Cordeiro, Ronald Harwerth
2000, Seoul	Paul Palmberg, Douglas Gaasterland Harry Quigley
2001, Orlando	Michal Schwartz Jack Crawford; Yeni Yücel, Robert Weinreb
Special Recognition	Douglas Anderson, Dunbar Hoskins, Stephen Drance
2002, Tokyo	Michael Kass, Mae Gordon Anders Heijl
2003, Firenze	Elke Lütjen-Drecoll, Paul Kaufman Paul Mitchell

The AIGS-Award 2004 Ceremony will be held on Thursday July 7, from 12.00-12.15 PM

The AIGS-Award is supported by an unrestricted educational grant from Pfizer Ophthalmics

TABBLAD ADVERTENTIE PFIZER

KEERZIJDE TABBLAD

ABSTRACTS

Opening Session
Didactic Program
Glaucoma Societies
Courses
Posters


FRANZ JOSEF I.
DER STADT WIEN 1869

Wednesday, July 6, 2005

2.00 – 2.35 pm.

O001 WELCOME – WORLD GLAUCOMA CONGRESS
R.N Weinreb
La Jolla, CA, USA

Objective: to discuss the AIGS and the significance of this inaugural Congress.
Main message: Enhanced glaucoma care through improved education, better research and facilitated cooperation of all constituencies in the global glaucoma enterprise.
Concept: AIGS is a global organization that seeks to improve standards for glaucoma management and research, as well as to facilitate and coordinate communication and collaboration among its members (Glaucoma Societies, Glaucoma Industry, Glaucoma Foundations, Glaucoma Patient Societies and other relevant organizations).
Conclusion: The World Glaucoma Congress is an integral component of the diverse activities of the AIGS that seek to improve glaucoma care, education and research through cooperation and collaboration among all relevant stakeholders.

O002 INTERNATIONAL COOPERATION
O. von Habsburg

The medical sciences have made recently significant advances last not least due to the cooperation between the nations within the European Union. There remains much to be done in order that this progress should continue. From this point of view, the European Union should learn a lot from worldwide experiences. In the United States of America, Silicon Valley has developed into one of the most potent motors of progress. It has also attracted many of the scientists and technicians of Europe who need broader spaces and more freedom in their research so that Europe can achieve the progress which it's past justifies. Such a decision would give a great impulsion to what has been in the past the glory of Europe and which taking into account the potential of our youth could entail a great promise for the future last not least in our medical sciences.

O003 GLAUCOMA COOPERATION IN ASIA
Y. Kitazawa
Tokyo, Japan

Objective: Overview the current, cooperative efforts made by glaucoma societies of Asian countries to promote a better understanding of glaucoma for betterment of patients' care.
Main message: In the presence of a great diversity of problems countries are faced with the cooperative efforts made by glaucoma societies have been successful not only in giving a birth to a consensus on the disease definition and guidelines but in exciting ophthalmologists' interest in epidemiological survey.

O004 GLAUCOMA COOPERATION IN LATIN AMERICA
R. Susanna
São Paulo, Brazil

Objective: Overview of the glaucoma care in Latin America as well as the impact of OHTS, EMGT, AGIS in the glaucoma management in Latin America.
Main message: Glaucoma care in Latin America.
Conclusions: 1. The term Hispanic should not be used in scientific papers; 2. AGIS had a great impact in glaucoma management in Latin America; 3. OHTS and EMGT had less impact; 4. Beta-blockers are the first choice drug in glaucoma treatment.

O005 THE WORLD GLAUCOMA CONGRESS
E.L. Greve
Wijdemeren, The Netherlands

Objective: To enlighten the audience on the World Glaucoma Congress concepts and organization.
Main message: Global communication on glaucoma science and care.
Concept: WGC has an all star faculty; short didactic lectures and a host of extensive courses; Glaucoma Society involvement: Inaugural Assembly, Glaucoma Society sessions, nominated clinician scientists; special attention to posters: walkthrough, session, recognition, Evidence Based quality of presentations; unforgettable Imperial Viennese Gala Ball; evaluation; cost effectiveness.
Conclusion: 1. High Quality didactic meeting; 2. Original concept; 3. Healthy social program.

To turn experience into speech – that is, to classify, categorize, to conceptualize, to grammarize, to syntactify it – is always a betrayal of experience, a falsification of it, but only so betrayed can it be dealt with at all, and only in so dealing with it did I ever feel a man, alive and kicking.

John Barth

DIDACTIC PROGRAM

Wednesday, July 6, 2005

2.40 – 4.00 pm.

D001 NON-GOVERNMENTAL ORGANIZATIONS & CENTRES OF EXCELLENCE

G.N. Rao
Hyderabad, India

Glaucoma is considered as a major emerging problem for the control of Blindness globally. As per recent WHO estimates, Glaucoma contributes to 12% of Global blindness, second only to Cataract. VISION 2020: The Right to Sight is a joint programme of World Health Organisation (WHO) and International Agency for the Prevention of Blindness (IAPB), the latter being an umbrella organization for all International Non-governmental Development Organizations around the world. These implement programmes through their vast network of partners globally. These can play an important role through VISION 2020, to develop approaches for the control of Glaucoma at multiple levels of eye care in conjunction with Glaucoma Specialists. In addition, strengthening of infrastructure, training of manpower and improving public awareness about Glaucoma are other important functions where such association can play a pivotal role. Centers of excellence should focus on the clinical care of complex Glaucoma problems, training of trainers and sub-specialities, all appropriate research and developing models for care at all levels – primary, secondary and tertiary – throughout the world. The aim is to reach everyone by combining 'Excellence' with 'Equity'.

D002 THE WHO PREVENTION OF BLINDNESS TEAM ACTIVITIES IN GLOBAL GLAUCOMA CONTROL

S.P. Mariotti
Geneva, Switzerland

Objective: Present the current structure and functions of the WHO PBD team and its involvement in glaucoma control.
Main message: The PBD team in WHO has been dealing mainly with control and elimination of blindness from various causes: onchocerciasis (OCP), trachoma (WHO-GET2020), cataract (PBL national programmes and committees). In recent years a new global partnership with IAPB has been created (Vision2020) to implement the WHA resolution calling for elimination of avoidable blindness. Glaucoma is a major cause of blindness in both developing and developed countries, yet not much happens in developing countries so far, mainly due to the burden of un-operated cataracts, and communicable causes of blindness (mainly trachoma). The recently published data on global Visual Impairments show that an action to develop management systems for chronic blindness causes is needed (Glaucoma and Diabetic retinopathy). A large body of evidence and examples are available for dealing with these blinding conditions, and PBD will review the available guidelines, discuss with experts on appropriate approaches for health systems in different development status, and provide Member States with strategies for management of Glaucoma and DR.
Conclusions: 1. Glaucoma is a major cause of visual impairments worldwide; 2. Action is needed in developing countries to develop management strategies involving human resources and infrastructure development; 3. The care available is often in capital town and not organized along the criteria of public health (access, equity, human rights); 4. WHO/PBD is requested to advice LDCs on how to prepare for dealing with these blinding conditions, mainly in those countries where communicable causes of blindness have been eliminated, in order to make access to eye care available for those in need; 5. Glaucoma and DR will be a major focus for WHO/PBD in the incoming years, in the normative work that is the mandate of WHO and in the partnership framework known as Vision2020.

D003 GLAUCOMA AS A WORLDWIDE HEALTH PROBLEM

H. Quigley
Baltimore, MD, USA

While 30 million are blind worldwide from cataract, the 8 million glaucoma blind are second most common[1,2]. Of 50 million with glaucoma, 2/3 have open angle glaucoma (OAG). Visual disability from angle closure (ACG) is proportionately greater[3], with 4 million blind each from OAG and ACG. A glaucoma definitional system was proposed to compare results across prevalence studies[4]. Disease was defined by optic nerve damage, evidenced by disc abnormality and field loss. Gonioscopic criteria for ACG are the most subjective definitional feature. OAG prevalence is greatest among Africans[5,6,7,8], less among Indians[9] and Hispanics[10], and least among European-derived persons[11]. ACG affects Asians, particularly Chinese persons more than others[12]. Further surveys are needed to determine glaucoma's heterogeneity and genetic basis. Women are three times more frequently affected by ACG, while OAG is not gender specific. Glaucoma is associated with increasing age[13]. Intraocular pressure (IOP) is closely associated with disease onset[14], severity, and therapeutic benefit[15]. The term 'normal tension' glaucoma is now obsolete. Case identification of glaucoma presently requires the specification of both structure of the optic disc and visual field damage[16]. Research is needed to make this determination more practical. Methods to identify the angle features that predispose to ACG have not been developed. Lowering IOP is efficacious for glaucoma, but its implementation is complicated by poor compliance in developed countries[17] and impracticality in the developing world[18]. For ACG, there is an important need to specify who will benefit from iridotomy and to what extent[19].

D004 RESEARCH PRIORITIES IN WORLDWIDE GLAUCOMA

R. Thomas
Hyderabad, India

Objective: I was asked to address the following questions: What prevalence surveys, studies and trials present new information about glaucoma in its global manifestations? Do clinical trials apply only to local situations or do they have global implications? Are the treatments of glaucoma applicable across ethnicities? What are the major research questions that need to be answered?
Main Message: Population based surveys have provided an estimate of the prevalence and burden of glaucoma in many parts of the world; the results are detailed in another presentation. What is clear is that worldwide, angle closure accounts for the majority of the blindness caused by glaucoma. The public health importance of a disease is assessed by the Population Attributable Risk percentage (PAR%); >20% is considered significant. The (effective) PAR% is 65% for closure versus 8.5% for OH and 18% for progression of POAG. Landmark clinical trials, OHTS, EMGT, CIGTS, AGIS and CNTGS provided evidence for the validity of treatment across the spectrum of POAG. Regrettably there are is a paucity of such data for angle closure. Ideally, to be valid, the trials should be reproduced on the local populations. In practice clinical trials are very labor intensive, expensive and difficult to reproduce. In the developing world populations we are referring to, there are other more addressable causes of blindness as well as other competing, perhaps more worthy opportunity costs. It would be more practical to ask 'are these populations so different from those in the trial that the results are invalid?' If not, it is more realistic to extrapolate the available information, building factors such as lower success, compliance and effectiveness. We should try to determine the risk of blindness for PACG and POAG in each population, identify those at risk for progression during their lifetime and define those in greatest need of treatment. We would need a strategy to identify the treat the worst case problems and recognize those in whom the risk of aggressive therapy is less than the risk of blindness and. For all this we should develop and use outcome measures that are relevant to those affected. Other research questions (partly abstracted from a meeting of international glaucomatologists) include: PAC&G: Estimate the risk of progression of PAC to glaucoma and blindness (without treatment?), with LPI and following lens extraction. Develop a surrogate method of diagnosis of PAC validated against gonioscopy. Validate the use of initial Iridotomy versus trabeculectomy (with or without lens extraction) in PACG. The long term effect of LPI on IOP needs to be determined. POAG: Evaluate FDT technique for identifying those with glaucoma damage in population-based samples, validating findings against threshold perimetry in each ethnicity. Develop screening guidelines that take into account the effectiveness of the methods and the age at which maximum yield of case identification and prevention of blindness can be achieved. Determine the spectrum of visual field loss in each population and its functional consequence by assessment of a meaningful quality of life measure.
Treatment: Survey present treatment methods in each major ethnic group and determine outcomes from present practice. Conduct clinical trials of medical, laser and surgical methods of lowering IOP in various settings. Develop new (or test existing) simple filtering surgery or drainage devices. Engage those organizations with resources and societal responsibility to affect glaucoma blindness.
Conclusion: 1. A lot has been achieved, but (too) much remains to be done; 2. This is especially true for Angle Closure; 3. As specialists we tend to approach glaucoma in isolation. From a public health perspective perhaps we would have a better chance of dealing with worldwide glaucoma if we integrated with comprehensive eye care rather than target the disease in isolation. 4. This model could be tested and generate some of the data alluded to.

D005 PUBLIC HEALTH ISSUES IN GLAUCOMA

I. Goldberg
Sydney, Australia

Objective: To assess the 'cost' of glaucoma diagnosis, treatment and visual disability that is caused by this group of diseases. To determine how this compares with other disorders in the public health spectrum. How does this impact on public health officials in developed and developing countries? How does this impact on those interested in glaucoma and its treatment?
Main message: Glaucomas increase in prevalence exponentially with age. As the population ages (the fastest growing segment is the group over 80 years) so the numbers of glaucoma patients is set to rise even faster. For open-angle glaucomas, while screening is not cost-effective in developed as well as developing societies, case detection is worthwhile. Upskilling of eye-care and health-care workers to improve case detection by identification of high-risk suspects and glaucoma cases is of value. For angle-closure, identification of high-risk subjects and use of prophylactic laser peripheral iridotomy and as needed peripheral iridoplasty will greatly reduce visual disability in identified ethnic groups, especially amongst Chinese and other Asian groups.
Conclusions: 1. There is a difference in treatment opportunities between open-angle glaucomas and angle-closure; 2. To reduce visual disability costs, case detection rather than screening is of value for open-angle glaucoma; Similarly, screening followed by prophylactic laser intervention is of value for populations at higher risk of angle-closure.

D006 HOW DOES THE TRABECULAR MESHWORK FUNCTION ?

E.R. Tamm
Regensburg, Germany

Objective: An intraocular pressure that is too high for the health of the optic nerve head is a major risk factor for the pathogenesis of glaucoma. Intraocular pressure is maintained through the aqueous humor circulation system in the anterior eye and an increase in aqueous humor outflow resistance in the trabecular meshwork causes abnormally high intraocular pressure in primary open angle glaucoma (POAG). The identification of the cellular and molecular factors that cause or contribute to aqueous outflow resistance in the trabecular meshwork is critical to understand the pathogenesis of POAG.
Main message: There is considerable evidence that most of the aqueous humor outflow resistance is generated in the juxtacanalicular part of the trabecular meshwork near the inner wall endothelium of Schlemm's canal. A second 'unconventional' outflow pathway exists, but contributes less than 10% of the total flow in the adult human eye and very likely does not contribute to the dynamics of aqueous humor outflow in the normal eye. Fluid flow close to the inner wall of Schlemm's canal is controlled by the number and location of pores in its endothelium, while resistance to flow is very likely generated in the extracellular matrix of the juxtacanalicular connective tissue. Metalloproteinases that degrade extracellular matrix components decrease trabecular outflow resistance, as do compounds that act on cell shape, volume and contractility of trabecular meshwork cells. Amount and composition of the extracellular matrix, the adhesion of the matrix to trabecular meshwork cells, and the shape of trabecular meshwork cells all modulate outflow resistance by altering the dimensions or direction of the extracellular flow pathways in the juxtacanalicular connective tissue. With increasing age, the resistance to aqueous humor outflow increases in this area. In parallel, the number of trabecular meshwork cells decreases while alterations in the extracellular matrix of the juxtacanalicular connective tissue occur. In eyes with glaucoma, there are increasing amounts of extracellular matrix in the juxtacanalicular area compared with age-matched normal eyes, suggesting that the amount and composition of the extracellular matrix may be critical for the glaucomatous increase in resistance. The exact molecular nature of the major proteins in the resistance barrier is clear neither in normal nor in glaucomatous eyes. A critical role has been discussed for myocilin, which is a secreted protein that is synthesized in very high amounts in the trabecular meshwork, and which is mutated in juvenile forms of primary open-angle glaucoma. So far, experimental studies in experimental transgenic mouse models with overexpression of myocilin have not supported the idea of a direct role for myocilin in the generation of aqueous humor outflow resistance. The turnover of the extracellular matrix in the trabecular meshwork is under control of transforming growth factor-β and bone

Wednesday, July 6, 2005

morphogenetic protein-7 with transforming growth factor-β causing an increase and bone morphogenetic protein-7 a decrease in extracellular matrix synthesis of trabecular meshwork cells.
Conclusion: Resistance to aqueous humor outflow depends on the amount and nature of the extracellular matrix in the trabecular meshwork. An increase in extracellular matrix in POAG likely causes the increase in aqueous humor outflow resistance, while a therapeutically induced decrease in matrix synthesis of trabecular meshwork cells might be a promising therapeutic approach to treat POAG.

D007 WILL WE BE ABLE TO SEE APOPTOTIC RETINAL GANGLIA CELLS?
M.F. Cordeiro
London, United Kingdom

The detection of degeneration of retinal ganglion cells (RGC) has previously not been possible *in vivo*. Instead, patients with glaucoma are currently screened and monitored clinically using conventional perimetry to identify a typical pattern of visual field loss. However, it has been estimated that up to 20-40% of RGC are lost before field defects are detected by this method. Standard clinical tests are therefore clearly inadequate at detecting early glaucomatous visual functional deficits. We have devised a new, non-invasive real-time imaging technique using confocal laser scanning ophthalmoscopy to visualise single retinal ganglion cell apoptosis in *vivo*. This allows longitudinal study of disease processes, which has not previously been possible. We have been able for the first time to image changes occurring in RGC apoptosis over hours, days and months, and show effects depend on the magnitude of the initial apoptotic inducer in several glaucoma-related models. This novel technique is an important advance in glaucoma because: 1. It is potentially a powerful new clinical tool with which to diagnose and identify patients with early glaucoma, before they lose vision; 2. It opens the door to directly observing effects of therapeutic strategies in glaucoma, by allowing for the study of potential neuroprotective drugs using meaningful endpoints that are based on the direct assessment of RGC death; 3. It may serve as a surrogate biomarker, providing real-time information that could dramatically reduce the duration of glaucoma clinical studies, which currently have to use visual field status as a key endpoint and determinant of outcome.

D008 IS GLAUCOMA A SYSTEMIC DISEASE CURABLE BY THERAPEUTIC NEUROPROTECTIVE VACCINATION?
M. Schwartz
Rehovot, Israel

Glaucoma has often been linked etiologically to high intraocular pressure (IOP). It is now evident that IOP is only one of several risk factors, albeit the most common. The search for ways (besides alleviation of primary risk factors) to stop the disease from progressing has opened up research in neuroprotection and neural cell renewal. We have shown that the body's defense and maintenance resource, the immune system, helps fight off the causes of progressive neurodegeneration. After a primary insult, lymphocytes (T cells) home to their specific eye-resident antigens, where they render the local immune cells (microglia) protective in a way that the eye can tolerate. To prevent or at least retard disease progression, we developed a vaccination that boosts the T-cell response. The antigens of choice are synthetic peptides that cross-react weakly with retinal and optic nerve self-antigens, evoking a response that allows their specific T cells to home to the lesion site and become weakly activated there in a way that leads to neuroprotection without risk of autoimmune disease. Our studies suggest that glaucoma, like other neurodegenerative diseases, although manifested at the site of disease, is also systemic in nature. Aging or other triggers of immune system deterioration might therefore be key factors not only in progression of the disease, but also in its onset. Accordingly, the age-related intensification in risk increases the demand for assistance from the peripheral immune system, which however is itself undergoing decay. T cell-based therapeutic vaccination might be therefore viewed as a means of bridging the widening gap between need and risk, thereby restoring homeostasis.

D009 GLAUCOMA MORE THAN THE EYE OF THE BEHOLDER
Y.H. Yucel
Toronto, Ontario, Canada

Objective: To review the experimental and human evidence that glaucoma is a disease that extends beyond the eye to involve major vision centers in the brain. The clinical relevance with respect to glaucoma disease detection, progression and treatment will also be discussed.
Main message: The death of retinal ganglion cells in glaucoma leads to the degeneration and loss of their target neurons in the brain. This spread of disease from affected neurons to connecting neurons is in keeping with transsynaptic degeneration, also seen in neurodegenerative diseases. A number of studies point to neurochemical and neuropathological changes involving the anterior optic pathway, the lateral geniculate nucleus and the visual cortex in experimental and human glaucoma. Understanding the nature of central visual system abnormalities in glaucoma will lead to new insights into the pathophysiology of glaucomatous injury and vision loss, and effective new treatment strategies.
Conclusions: 1. Degenerative processess in glaucoma extends to central visual pathways in the brain and involve the magno-, parvo-, and koniocellular pathways in the geniculocortical pathways; 2. In moderate and advanced glaucoma, degenerative changes in the brain are transsynaptic in nature and proportional to optic nerve damage; 3. In early glaucoma, alterations at neuron connection sites in the lateral geniculate nucleus may occur prior to detectable optic nerve fiber damage and contribute to early visual dysfunction; 4. A multidisciplinary approach to understanding brain changes in glaucoma may contribute significantly to new insights into the disease process and its optimal treatment.

D010 WHAT DAMAGES THE OPTIC NERVE IN GLAUCOMA?
R.N. Weinreb
La Jolla, CA, USA

1. Glaucoma is a neurodegenerative disease characterized by the slow, progressive degeneration of retinal ganglion cells; 2. The pathophysiology of glaucomatous neurodegeneration is not fully understood; 3. The level of intraocular pressure is unquestionably related to the death of retinal ganglion cells (RGCs) and optic nerve fibers in some, if not all, patients with primary open angle glaucoma; 4. Other factors can individually or collectively contribute to RGC and optic nerve fiber death: a. Ischemia-hypoxia; b. Excessive stimulation of the glutamatergic system; c. Poorly functioning cellular pumps and glutamate transporters; d. Oxidative stress and formation of free radicals; e. Aberrant immunity.

4.30 – 5.30 pm.

D011 GLAUCOMA EXAMINATION
P. Lee
Durham, NC, USA

Objective: Place current patterns of practice in the USA in the context of new knowledge from clinical trials and practice guidelines.
Main message: Important results from best-evidence trials such as OHTS, EMGT, CIGTS, and other glaucoma studies emphasize the value of key evaluation and management parameters in reducing the risk of vision loss due to glaucoma. Significant opportunities exist in the USA to take advantage of these results in the context of caring for patients with glaucoma, particularly in the assessment and use of optic nerve and associated data. Newer techniques may provide means for better aligning care patterns with the findings of the important clinical trials.
Conclusions: Approaches that assist physicians in providing best-evidence care to patients with glaucoma will become important innovations in enhancing outcomes with glaucoma.

D012 MEDICAL ADVICE FROM GLAUCOMA INFORMATICS (MAGI) STUDY: DIAGNOSIS AND FOLLOW-UP OF GLAUCOMATOUS VISUAL FIELDS
P.A. Sample, T-W Lee, C. Boden, Z. Zhang, K. Chan, J. Hao, C. Bowd, F.A. Medeiros, L.M. Zangwill, R.N. Weinreb, M.H. Goldbaum
La Jolla, CA, USA

Objective: To explain the basic components involved in machine learning and to demonstrate the function and utility of machine learning classifiers (MLCs) for diagnosis and follow-up of glaucoma.
Main message: Machine learning classifiers provide several advantages over currently used methods for assessing visual fields and results from imaging devices to determine if early glaucomatous damage is present or if glaucoma is progressing. Both supervised and unsupervised classifiers have been very useful for this task. A summary of these results will be given with the results from one specific classifier, the variational Bayesian Independent Component Analysis-mixture model (vB-ICA-mm), used as an example for assessing standard visual fields.
Conclusions: 1. Supervised MLCs can separate visual fields of eyes with glaucoma from fields of normal eyes with a sensitivity and specificity equal to or better than statpac analyses or glaucoma experts; 2. Supervised MLCs improve on performance of other analyses when analyzing data from Heidelberg Retinal Tomograph (HRT); 3. Unsupervised MLCs also obtain good sensitivity and specificity in addition to providing important information about the patterns of visual field loss found in glaucomatous visual fields; 4. The vB-ICA-mm can quantitatively identify progression in eyes with glaucoma by evaluating change in one or more patterns of the visual field loss while other areas or patterns remain stable. This, in a sense, enables the non-progression areas of each individual's field to serve as a control to determine if change along one or more axes is true progression or due to variability.

D013 WE SHOULD MEASURE IOP CONTINUOUSLY
P.W. Walter
Aachen, Germany

Objective: To review current methods of continuous measurement of the intraocular pressure.
Main message: Using modern micromachining technology it seems to be possible to fabricate pressure sensors which can be implanted into the eye and which can be coupled to telemetry systems for continuous monitoring of the intraocular pressure. Such systems will give new insight in the role of the intraocular pressure under daily life conditions.
Conclusions: 1. The integration of pressure sensors within active telemetry systems is possible; 2. Data and energy transfer after implantation was proven; 3. Further biocompatibility studies with respect to material stability are currently performed.

D014 IS GENE THERAPY COMING?
P. Kaufman
Madison, USA

With understanding of the biochemical pathways and molecular mechanisms regulating aqueous humor production and drainage, and retinal ganglion cell death and survival, comes the possibility of manipulating those pathways and mechanisms genetically, to therapeutic advantage in glaucoma. Strategies for inserting therapeutically relevant genes into target tissues for glaucoma will be discussed in both experimental and clinical settings.
The basic strategy: Reprogram target cells to make more or less of something.
Method: Viral vector incorporating the gene of interest.
Consequences: Up or down regulate a biochemical / physiological process
Obstacles: Duration of expression, viral toxicity, turning gene on/off, immune/inflammatory responses, localization of transfection and/or gene activity.

D015 RELATIVE MERITS OF VARIOUS TREATMENT MODALITIES
R. Hitchings
London, United Kingdom

Objective: Review briefly therapeutic options in the management of open angle glaucoma.
Main message of the presentation is the development of understanding of risk benefit ratio. This will be expanded into the concept of risk from treatment titrated against potential benefits of treatment. Conclusions will be 1. Medical therapy is (relatively) safe requires adherence and persistence but may be ineffective in achieving a target pressure; 2. Laser therapy is ideal for the patient with moderate target pressures whose ability to persist with treatment is hindered by amnesia, arthritis or cost; 3. Surgery offers the best approach for low target pressures. Benefits need to be outweighed against the perceived medium and long term risks.

Wednesday, July 6, 2005

D016 WILL TRABECULECTOMY SURVIVE?
R.A.L. Lewis
Sacramento, CA, USA

Despite well recognized short and long term complications, trabeculectomy has been the principal incisional procedure for glaucoma for almost 50 years. Will trabeculectomy survive? The tremendous advance in our understanding of ocular anatomy and disease has fostered a variety of alternative approaches to treating glaucoma.
Objective: To review the many novel procedures under consideration to achieve the ultimate therapeutic goal in glaucoma which is to maintain and/or restore vision.

General concepts: (1) IOP lowering procedures, (2) optic nerve neuroprotection/regeneration, and (3) vision restoration. IOP lowering surgery will focus principally on those procedures that increase outflow by allowing the egress of fluid using physiologic as well as non physiologic, artificially, created channels of the cornea, sclera, canal of Schlemm and suprachoroidal space. Recent breakthroughs in optic nerve regeneration and vision restoration will be discussed. The glaucoma patient of the future is not likely to be offered a conventional trabeculectomy procedure to lower intraocular pressure. Instead, the treatment will focus on a more customized approach based on specific disease parameters and unique individual characteristics to control IOP as well as restore visual function.

I am endowed with a cheerful temper, a moderate sensibility, and a natural disposition to repose rather than activity; some mischievous appetites and habits have perhaps been corrected by philosophy or time. The love of study, a passion which derives fresh vigour from enjoyment, supplies each day, each hour, with a perpetual source of independent and rational pleasure, and I am not sensible of any decay of the mental faculties. The original soil has been highly improved by cultivation; but it may be questioned whether some flowers of fancy, some grateful errors, have not been eradicated with the weeds of prejudice.

Edward Gibbon

Thursday, July 7, 2005

8.30 – 10.00 am.

D017 DOCUMENTING THE OPTIC NERVE

D.S.G. Greenfield
Palm Beach Gardens, FL, USA

Objective: Documentation of the optic nerve is critical to glaucoma diagnosis and monitoring. This presentation will review the strengths and limitations of the methodology available for optic nerve documentation.
Main message: Evidence suggests that clinicians do not comply with glaucoma practice guidelines that emphasize the importance of optic nerve documentation. Clinical descriptions of cup-disc ratio and neuroretinal rim integrity are important in glaucoma monitoring but do not replace optic disc documentation. Detailed drawings of the optic nerve provide a cost-effective means of documentation but are limited by poor reproducibility and imprecise quantification of disc size and degree of damage. Stereoscopic optic disc photography represents the gold-standard technique for documenting the optic nerve appearance and provides an opportunity to illustrate non-quantitative features of the optic disc such as pallor and hemorrhage. Newer imaging technologies such as scanning laser ophthalmoscopy (SLO) provide a more objective and reproducible means of documenting quantitative optic disc characteristics such as neuroretinal rim area, cupping and disc area. Strong evidence exists to support a high degree of concordance between topographic assessments using the SLO and stereoscopic disc assessments.
Conclusions: 1. Optic disc documentation is critical for glaucoma diagnosis and monitoring; 2. Optic disc documentation is under-performed in clinical practice; 3. Baseline stereoscopic optic disc photography should be performed in all glaucoma patients and suspects; 4. Newer objective imaging technologies represent an important clinical adjunct for optic disc documentation.

D018 PHOTOGRAPHY. DIAGNOSIS BASED ON STRUCTURE

B. Jonas
Mannheim, Germany

Objective: Optic nerve diseases such as the glaucomas lead to changes in the intrapapillary and parapapillary region of the optic nerve head.
Main message: These changes can be described by the variables size and shape of the optic disc, size, shape and pallor of the neuroretinal rim, size of the optic cup in relation to the area of the disc, configuration and depth of the optic cup, ratios of cup-to-disc diameter and cup-to-disc area, position of the exit of the central retinal vessel trunk on the lamina cribrosa surface, presence and location of splinter-shaped hemorrhages, occurrence, size, configuration and location of parapapillary chorioretinal atrophy, diffuse and/or focal decrease of the diameter of the retinal arterioles, and visibility of the retinal nerve fiber layer. The variables can semiquantitively be assessed upon ophthalmoscopy without applying sophisticated techniques. For the early detection of glaucomatous optic nerve damage in ocular hypertensive eyes prior to the development of visual field loss, the most important variables are neuroretinal rim shape, optic cup size in relation to optic disc size, diffusely or segmentally decreased visibility of the retinal nerve fiber layer, occurrence of localized retinal nerve fiber layer defects, and presence of disc hemorrhages.
Conclusions: These morphological parameters of the optic nerve head may be useful for the detection of glaucomatous optic neuropathy.

D019 DIAGNOSIS BASED ON CONFOCAL SCANNING LASER TOPOGRAPHY

D.F. Garway-Heath
London, United Kingdom

Objective: To review, from evidence in the literature, the role of confocal scanning laser topography (CSLT) in the diagnosis of glaucoma in various clinical settings. Evidence considered includes the proportion of subjects from whom images can be acquired, variation between observers and images, the proportions of glaucoma patients and normal subjects correctly identified by various mathematical algorithms, and likelihood ratios. Glaucoma is a chronic progressive condition and in cases of suspect glaucoma the diagnosis of glaucoma often is made on the basis of identified progression. The role of CSLT in identifying progression will be outlined briefly.
Main message: CSLT is easily applied in the clinical setting and useful images may be obtained from the majority of patients. Between-image and between-observer variation is low. Diagnostic precision is high, but insufficient for case-finding if used as the only test. However, the strong positive likelihood ratio makes CSLT a valuable tool in addition to other tests. The high reproducibility of CSLT makes the instrument suitable for monitoring for progression.
Conclusions: CSLT is: 1. a useful adjunct to a clinical examination for diagnosis; 2. provides a permanent record of the optic nerve head appearance; 3. is a sensitive instrument with which to detect progression.

D020 CONFOCAL SCANNING LASER POLARIMETRY

H.G. Lemij, N.J. Reus
Rotterdam, Netherlands

Objective: to give an overview of the working principle of scanning laser polarimetry (SLP) and its role in glaucoma diagnostics. SLP is commercially available in the GDx VCC (Carl Zeiss Meditec, Jena, Germany).
Main message: SLP provides quantitative measures of retinal nerve fibre layer (RNFL) thickness. The GDx VCC has a built-in variable cornea compensator. Previous versions of the technology did not have such a compensator, which led to erroneous measurements in specific eyes. The GDx VCC has been shown to discriminate well between glaucomatous and healthy eyes. Its relationship with standard automated perimetry is curvilinear, which suggests that it can detect glaucomatous RNFL thinning before standard visual field defects become apparent. There is building evidence that it indeed detects such 'preperimetric' glaucoma. Its role in follow-up of glaucoma is not yet determined, but appears promising.
Conclusions: 1. SLP provides an objective measure of RNFL thickness; 2. Its reproducibility of measurements is high; 3. It discriminates well between healthy and glaucomatous eyes; 4. It probably detects glaucoma earlier than standard automated perimetry; 5. Its role in glaucoma follow-up appears to be promising.

D021 OPTICAL COHERENCE TOMOGRAPHY

F.A.M. Medeiros
La Jolla, CA, USA

Objective: To review the currently available evidence on the use of OCT for diagnosis and evaluation of glaucoma.
Main message: Several studies have shown that retinal nerve fiber layer (RNFL) assessment with OCT is able to discriminate patients with glaucomatous visual field loss from healthy subjects. The evidence is less clear with regards to the diagnosis of glaucoma before development of visual field loss. RNFL assessment seems to be superior to the analysis of macular thickness parameters using the same technology. Recent evidence points towards the use of OCT optic disc topography measurements for glaucoma evaluation and to a possible improvement in the diagnostic accuracy when RNFL and optic nerve head parameters are combined. One study has recently provided evidence for the role of OCT in the detection of progressive nerve fiber layer damage in glaucoma.
Conclusions: 1. There is good evidence to support the use of OCT RNFL assessment as a complementary tool in the diagnostic evaluation of glaucoma. 2. Further studies are necessary to assess the usefulness of OCT as a potential tool for evaluation of progressive damage in glaucoma.

D022 THE INTERPRETATION OF STANDARD AUTOMATED PERIMETRY

P.A. Sample
La Jolla, CA, USA

Objective: To review standard automated perimetry (SAP) for diagnosis and follow-up of glaucoma with emphasis on results obtained with the Swedish Interactive Thresholding Algorithm (SITA) and the Statpac Analyses available on Humphrey visual field analyzer. Some new results with SITA adapted for Short-wavelength Automated Perimetry (SWAP) will also be presented.
Main message: Standard automated perimetry is used to diagnose and follow patients at risk for or with glaucoma. It has been the clinical standard for the past three decades. During this time several improvements in the analysis packages provided with perimeters and in the methods for obtaining visual field results have been introduced. This presentation will review the best ways to evaluate visual fields from the printouts, giving the rationale for various plots and indices provided by statpac. In addition, a brief description of SITA will be given highlighting its similarities and advantages over other thresholding techniques. Finally, results with the modifications of SITA for SWAP will be given as a lead in Dr. Johnson's talk, which will discuss other improvements to perimetry that selectively test specific aspects of visual function for improved diagnosis and management of glaucoma.
Conclusions: Assessing Visual Field Results: 1. Greyscale plots should not be used when interpreting visual field results; 2. The glaucoma hemifield test, pattern standard deviation, and the pattern deviation plot are most specific and sensitive for following glaucoma; 3. Comparison of the total deviation and pattern deviation plots is useful for identifying global effects on the visual field, such as those introduced by cataracts; SITA vs. Full Threshold Testing: 1. SITA shortens test time considerably compared to full threshold testing (4-6 minutes *vs.*10-15 minutes); 2. SITA-SWAP has an even shorter test time (3.5 to 5 minutes); 3. SITA results over time are less variable than full threshold results; 4. Thresholds are on average 3 (SAP) to nearly 5 (SWAP) dB better with SITA than with full threshold testing so comparing threshold values across algorithms is not recommended; 5. Probability plots and other indices compare very well between the two thresholding algorithms; 6. Results with SITA-SWAP compare well to those obtained with full thresholding; 7. When changing from full threshold to SITA on a given patient it is wise to perform both types of testing on the same day to identify any algorithm-specific differences which may influence clinical decisions regarding the stability of glaucoma-related field loss.

D023 SELECTIVE TESTS OF VISUAL FUNCTION

C.A. Johnson
Portland, OR, USA

This presentation will briefly discuss several visual function test procedures that are used in the diagnosis and evaluation of glaucoma through perimetric testing. The procedures include Short Wavelength Automated Perimetry (SWAP), SITA SWAP, Frequency Doubling Technology (FDT) perimetry, multifocal visual evoked potentials (mfVEPs) and rarebit perimetry. The presentation will include a description of the various perimetric techniques and their underlying physiological basis, current performance characteristics, a comparison of methods, and the advantages and disadvantages of each procedure. The clinical capabilities and limitations of each procedure will be described.

D024 ABNORMAL VISUAL FUNCTION IS REQUIRED FOR DIAGNOSIS

A. Heijl
Malmö, Sweden

Objective: To explain why diagnosing glaucoma should be avoided in the absence of visual function deficits, i.e. visual field defects.
Main message: 1. Diagnosing glaucoma in the absence of clear visual field defects is difficult and is associated with great risks for false positive diagnoses; a. Subjective interpretation of the optic disk is associated with a high rate of false positive diagnoses, particularly in eyes with large optic discs; b. Even experts find a considerable proportion of apparent (false) RNFL defects in normal subjects; c. Most patients with optic disc haemorrhages without concurrent visual field defects still have normal visual function nine years later; d. Many modern systems for image-based diagnosis are new and lack documentation that make their use in glaucoma diagnosis evidence-based; e. There is insufficient evidence that glaucoma functional deficits can be detected earlier with non-standard perimetry than with standard white-on-white automated perimetry; 2. A diagnosis of glaucoma is associated with a decrease in the patient's quality of life; 3. The great majority of patients with pre-perimetric glaucoma, if such a diagnosis could be made with sufficient certainty, are unlikely to experience any subjectively disturbing glaucoma damage during their life-time.
Conclusions: Making a glaucoma diagnosis in the absence of visual field defects is risky, decreases the patient's quality of life and is seldom of any value to the patient.

DIDACTIC PROGRAM

Thursday, July 7, 2005

D025 ABNORMAL VISUAL FUNCTION IS NOT REQUIRED FOR THE DIAGNOSIS OF GLAUCOMA
G.A. Cioffi
Portland, OR, USA

Glaucoma is characterized as a progressive optic neuropathy that develops in the face of a number of different risk factors. The most important and identifiable of these risk factors is intraocular pressure, although this does not seem to be necessary in all patients for the development of disease. Our understandings of the relationship between the structural change of the optic nerve and the functional deficits that result have evolved over time. Two forces have shaped our thoughts about the structure/function relationship. In the past, functional deficit has been a requirement for diagnosis; however, we now realize that structural abnormalities may occur without overt signs of functional decline. The forces that have shaped our thoughts about the structure/function relationship are our clinical ability to measure a change (that is, the sensitivity of our testing paradigms) and our understanding of the mechanisms of retinal ganglion cell death. Over time, we have moved from a macro-view of glaucomatous optic neuropathy to a micro-view. With this evolution, our testing paradigms for both structural and functional change have increased in sensitivity. In many respects, our ability to detect structural change has been better than our detection of functional change. This talk will focus on the changing paradigm of the structure/function relationship and why an abnormal visual function test is not required for the diagnosis of glaucoma.

D026 UPDATE ON CONSENSUS ON STRUCTURE AND FUNCTION
R.N. Weinreb, E.L. Greve
La Jolla, CA, USA

***Objectives*:** To summarize, discuss and update the consensus points obtained from the inaugural AIGS consensus meeting on glaucoma diagnosis (structure and function) that was held in San Diego on November 13-14, 2003.
***Statements*:**
Structure: 1. A method for detecting abnormality and also documenting optic nerve structure should be part of routine clinical management of glaucoma. *Explanation*: It is known that documentation of optic nerve structure is often missing in routine ophthalmology practice. 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.*Explanation*: Experts evaluating stereophotographs are those who have had specialized training and experience in this technique. 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. *Explanation*: Digital imaging is available for scanning laser tomography, scanning laser polarimetry and optical coherence tomography. Digital imaging also is possible for photography, but assessment remains largely subjective. 4. Automated analysis of results using appropriate databases is helpful for identifying abnormalities consistent with glaucoma. *Explanation*: The comparison of results of examination of individual patients with those of an appropriate database can delineate the likelihood of abnormality. Structural assessment should preferably include such a biostatistical analysis. 5. Different imaging technologies may be complementary, and detect different abnormal features in the same patients. *Note 1*: At this time, evidence does not preferentially support any one of the above structural tests for diagnosing glaucoma.
***Function*:** 6. A method for detecting abnormality and documenting functional status should be part of routine clinical management of glaucoma. 7. It is unlikely that one functional test assesses the whole dynamic range.
8. Standard Automated Perimetry (SAP), as usually employed in clinical practice, is not optimal for early detection. 9. With an appropriate normative database, there is emerging evidence that short wavelength automated perimetry (SWAP) and possibly also frequency doubling technology perimetry (FDT) may accurately detect glaucoma earlier than SAP. *Explanation*: Earlier detection of glaucomatous damage with SWAP and FDT than with SAP has been consistently demonstrated. 10 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. *Explanation*: At this time, there is no evidence to support the superiority of either SWAP *vs.* FDT.
***Function & Structure*:** 11. Published literature often lags behind the introduction of new technology. Therefore literature based on previous versions of current technology should be viewed with caution. 12. In different cases, either structural examination or functional testing may provide more definitive evidence of glaucoma, so both are needed for detection and confirmation of the subtle early stages of the disease. *Note 2*: Data from both functional and structural examinations always should be evaluated in relation to all other clinical data.

10.30 – 12.00 am.

D027 RISK FACTORS FOR PROGRESSION OF GLAUCOMA
S. Friedman
Baltimore, MD, USA

Objective: To review the evidence in the literature for risk factors for glaucoma progression.
Main Message: Publications have documented that some persons with primary open-angle glaucoma are more likely to progress during follow-up than others. Understanding which patients are at greatest risk can help physicians decide how aggressively to treat. This presentation will review the literature on this topic.
Conclusions: 1. Some persons with glaucoma are progressing more rapidly than others; 2. Risk factors are known that are associated with greater risk of progression; 3. Assessing each patients risk will improve the care given.

D028 FUNCTION ASPECTS OF PROGRESSION
B.C. Chauhan
Halifax, Canada

Objective: To provide a practical guideline for the clinical use of perimetry for detecting progression in glaucoma.
Main message: 1. Review importance of measuring functional progression; 2. Discuss the techniques and tools for measuring progression and their relative merits; 3. Stress the importance of variability and how to interpret it; 4. Stress that the detection of progression usually requires several examinations in the case of actual progression. This is particularly important in a slowly progressing disease like glaucoma.
Conclusions: 1. Detection of functional progression is a cornerstone of clinical practice in glaucoma; 2. There is no external 'gold-standard' for glaucoma progression and that progression criteria are necessarily arbitrary.

D029 STRUCTURE ASPECTS OF PROGRESSION
C.A. Girkin
Birmingham, AL, USA

Objective: To review current techniques of assessing the optic nerve subjectively and with optic nerve and retinal nerve fiber layer analyzers in the detection of progressive glaucomatous injury.
Main message: Subjective assessment of the optic disc and nerve fiber layer is critical in detecting progression in glaucoma. Objective imaging techniques show great promise in the detection of progressive disease. However, prospective data with current imaging modalities are only available for confocal scanning laser ophthalmoscopy.
Conclusion: 1. Structural progression can occur without concurrent visual field progression; 2. Is critically important in early to moderate glaucoma; 3. Subjective evaluation remains the primary methods of detecting structural progression; 4. Objective analysis techniques are promising adjutants in detecting progression.

D030 FUNCTION AND STRUCTURE ASPECTS OF PROGRESSION
L.M. Zangwill
La Jolla, CA, USA

Objective: To review the evidence documenting the temporal relationship between detectable structural and functional change in glaucoma.
Main message: The temporal relationship between detectable structural and functional change in glaucoma is influenced by the type of structural and functional testing completed, the measurement scale used, the stage of disease studied, and particular patient characteristics. The results of recent randomized clinical trials, including the Ocular Hypertension Treatment Study, Early Manifest Glaucoma Study and the European Glaucoma Prevention Study using stereophotography to document structural change and standard automated perimetry to document functional change, suggest that either structural or functional change can be the first sign of glaucomatous changes in subjects with ocular hypertension and early glaucoma. The results of these clinical trails as well as other longitudinal studies using imaging instruments to document structural change, and retinal ganglion cell specific perimetry to detect functional change suggest that with current diagnostic techniques, structural and functional testing provide largely independent measures of progression. The similarities and differences in the methods for structural and functional assessment will be reviewed and the results of these studies compared.
Conclusions: 1. With current diagnostic techniques structural and functional testing provide largely independent measures of glaucomatous progression; 2. Glaucoma management should include both structural and functional testing.

D031 QUALITY OF LIFE AND GLAUCOMA I
R.K. Parrish
Miami, FL, USA

Objective: Understand the concept of measuring quality of life and visual function, and explain the differences between them. Understand the difference among general, organ specific, and glaucoma specific testing instruments.
Main message: Glaucoma affects quality of life in ways that may be measured with general health (SIP, SF-36), organ specific (VF-14), and disease specific instruments. Correlations between self reported quality of life, visual function, and objective measures of glaucomatous optic nerve or visual field damage depend on the type of instrument used to measure the effect. Generally speaking, the more vision specific the questionnaire, the less generalizable are the results to general health quality of life functions. Patients with advanced optic neuropathy may have few measurably reduced functions when tested with general quality of life instruments. Bilateral simultaneous visual field testing (Estermann) may approximate daily visual field functioning more accurately than testing each eye individually[1]. The technique of determining 'time trade off' by asking a patient how many years of life expectancy they would exchange for perfect visual function may offer another subjective assessment of impact of glaucoma.
Conclusions: Visual function, a complex product of visual acuity, peripheral visual field, and higher cortical function affects the quality of life. Dfferent testing instruments may provide insight about how specific diseases affect the quality of life. Comorbidities, such as chronic illness, may impact quality of life as measured with organ specific instruments.
References:
1. Parrish RK II, Gedde SJ, Scott IU, Feuer WJ, Schiffman JC *et al.* Visual function and quality of life among patients with glaucoma. Arch Ophthalmol 1997; 115: 1447-1455.

D032 QUALITY OF LIFE AND GLAUCOMA II – IMPACT OF GLAUCOMA ON VISION-TARGETED HEALTH RELATED QUALITY OF LIFE
M.A. Araie
Tokyo, Japan

Worldwide, about 150 million people are estimated to be visually disabled and glaucoma is the third most common cause of visual impairment. The concepts of quality of life include physical functioning, health perception, emotional well-being and satisfaction of patients. A better understanding of impact of glaucoma on patients' vision-targeted health related quality of life, that is, patients' perception of capacity for visually independent daily living, should be important in estimating patients' status, clinical management and estimating benefits of treatment, just as important as routine clinical measures such as intraocular pressure or perimetric performance. To know patients' perception of visual disability, the use of questionnaires where patients self-assess their skills and abilities is probably the most accurate and efficient means at present. So far, several questionnaires have been developed to estimate vision-targeted health related quality of life in patients with ocular disorders, and studies applying these questionnaires to glaucoma patients revealed that glaucoma patients perceive visual disability even in the early stage of the disease and that significant correlation exists between their perception of visual disability and the extent of the visual field loss, especially that in the lower central hemifield. Glaucoma is a rather unique ocular disorder where central visual acuity is often retained until the late stage of the disease. Thus, a questionnaire intended to assess visual disability caused by visual field impairment rather than visual acuity impairment may be more useful in managing

glaucoma patients. Further, the notion of disability or emotional well–being is known to be highly culturally and socially influenced. Since many of the previous questionnaires were grounded on the culture and language of English-speaking people, it is desired to develop questionnaires for glaucoma patients with different cultures and languages.

D033 THE MOLECULAR GENETICS OF GLAUCOMA
W. Alward
Iowa, IA, USA

Objective: To review the current state of knowledge of the genetics of glaucoma.
Main message: The genes for various forms of glaucoma are being discovered. There are now seven known chromosomal loci for primary open angle glaucoma (POAG). These loci are felt to harbor disease-causing genes – they are called GLC1A through GLC1G. For three of these loci the genes have been discovered (myocilin, optineurin, and WDR36). Genes have been described for other forms of glaucoma as well such as primary congenital glaucoma (CYP1B1), aniridia (PAX6) and Axenfeld-Rieger syndrome (PITX2 and FOXC1). The study of glaucoma genetics promises to improve our diagnosis and treatment of glaucoma.
Conclusions: 1. There are three genetic loci for POAG (GLC1A – GLC1G); 2. There are three identified POAG genes (myocilin, optineurin, and WDR36); 3. There is one identified gene for congenital glaucoma (CYP1B1); 4. There are genes identified for several developmental glaucomas.

D034 SYSTEMIC FACTORS IN EXFOLIATION SYNDROME AND EXFOLIATIVE GLAUCOMA
R. Ritch
New York, NY, USA

Exfoliation syndrome (XFS) is an age-related disease characterized by the production and progressive accumulation of a fibrillar extracellular material in many ocular tissues. It has only recently been recognized to be the overall most common identifiable cause of glaucoma, and in some countries accounts for the majority of the glaucoma. Exfoliation-like fibrils have been found in many organs by electron microscopy, suggesting it to be a as a generalized or systemic disorder of the extracellular matrix, long recognized only in the eye because of its visibility on slit-lamp examination and the fact that it causes glaucoma. Associations with systemic disorders and blood flow abnormalities are being increasingly reported. These include elevated plasma homocysteine, transient ischemic attacks, stroke, aortic aneurysm, angina, myocardial dysfunction, myocardial infarction, systemic hypertension, Alzheimer's disease and hearing loss. Reported blood flow abnormalities, both in the eye and in the brain, include reduction of flow in the middle cerebral artery, optic nerve, and peripapillary retina. However, two series have reported no increase in mortality rates in patients with XFS, while another reported that comorbidity with acute cerebrovascular disease and chronic cerebral diseases were more common in patients with exfoliative glaucoma than in patients with primary open-angle glaucoma. Further studies are warranted.

Order in daily life and in history, order in the social and political category is unattainable . . . . where is it attainable? . . . . the work of art stands up by itself, and nothing else does . . . it is the one orderly product which our muddling race has produced.

E.M. Forster

DIDACTIC PROGRAM

Friday, July 8, 2005

8.30 – 10.00 am.

D035 GONIOSCOPY
S. Friedman
Baltimore, MD, USA

Objective: Documentation of angle findings is critical to glaucoma diagnosis and treatment. This presentation will review the optimal approaches to gonioscopy in clinical practice.
Main Message: Angle-closure glaucoma is likely underdiagnosed, leading to improper treatment of
patients. Understanding how to assess the angle in a systematic fashion in low illumination can improve
diagnostic precision. Various grading methods are available and will be reviewed. Angle changes induced
by excessive illumination will also be demonstrated.
Conclusions: 1. Gonioscopy should be performed on all patients over 40 years of age; 2. All individuals followed for glaucoma or ocular hypertension should have regular gonioscopy; 3. Gonioscopy needs to be performed with minimal illumination; 4. Limbal anterior chamber depth offers additional information to guide physicians and also can be incorporated into clinical practice.

D036 DIAGNOSIS: UBM
P. RojanaPongpun
Bangkok, Thailand

Objective: Demonstrate how to use UBM in diagnosis and understand the different mechanisms of angle closure (AC) glaucoma. To present UBM criteria and case samples.
Main message: Ultrasound biomicroscopy (UBM) obtains high resolution image of anterior segment structures and their relationships by using 50 MHz high frequency transducer that yields axial resolution up to 25µ with lateral resolution of 50µ. Interpretation and analysis can be made qualitatively and quantitatively. Pupillary block can be easily identified by the characteristic contour of iris. UBM reveals an increase in iris-lens contact after LPI. This provides new insight that sphincter muscle force, which thought to play an important role in AC, has very little effect as trigger mechanism for AC. UBM also demonstrates that anterior rotation and elongation of ciliary process causes plateau iris configuration that leads to AC. More importantly, UBM provides information on dynamic change of angle structures in light and dark condition which may yield important information on hidden mechanism in certain cases. Anterior chamber depth, iris thickness and posterior chamber area can be visualized, thus help in understanding some of the less well defined mechanism like peripheral angle crowding and lens component in mixed AC mechanism. UBM is also used to study effect of medication on angle structure change. For quantitative analysis, new parameters and algorithms have been introduced to enhance the usefulness of UBM in both diagnosis and follow up of progression.
Conclusions: UBM becomes an essential diagnostic tool in differentiating various underlying mechanisms of AC. Both qualitative and quantitative analysis can be performed to provide more information that are used in diagnosis as well as detect dynamic change of the angle structure.

D037 DIAGNOSIS OF ANGLE CLOSURE WITH OCT
Tin Aung
Singapore National Eye Centre; National University of Singapore

Objective: To review recent advances in imaging for angle closure glaucoma using OCT.
Main Message: Recent advances in imaging have led to more objective ways of defining the angle. The anterior segment optical coherence tomograph (AS-OCT) is
a new non-contact instrument that rapidly obtains high-resolution images of the angle. The device allows qualitative and quantitative angle imaging, which is objective and reproducible. The image capture scan takes less than 10 seconds and there are no side-effects to this imaging.
Conclusions: The AS-OCT is a promising new tool for the diagnosis of angle closure glaucoma.

D038 DIFFERENTIAL DIAGNOSIS IN PRIMARY ANGLE-CLOSURE
J. Foster
London, United Kingdom

Objective: To discuss the differential diagnoses for various stages of primary angle-closure and angle-closure glaucoma.
Main Message: Differential diagnosis for primary angle-closure differs according to the stage of the disease and the physical signs on which the diagnosis has been considered. A. Narrow drainage angle (differential from 'primary' mechanism). Gonioscopic artefact. Supra-ciliary effusion: *e.g.* VKH syndrome, following heavy retinal laser. Ciliary body and iris cysts. Lens-induced. Retro-lenticular forces: e.g. intraocular haemorrhage, vitreo-retinal tamponade. Orbital masses/diseases. Systemic or locally administered medication. B. Primary angle-closure (defined by narrow angle with PAS or raised IOP). i. Peripheral anterior synechiae. Goniodysgenesis. Neovascularization of iris and angle (diabetic, retinal vein occlusion, Coat's dis.). Neoplastic deposits or infiltrates. Irido-corneal endothelial syndrome. Primary iridoschisis. ii. High ocular hypertension with corneal oedema. Hypertensive uveitis (esp. Posner Schlossman Synd) where gonioscopy may be difficult due to corneal oedema. Other causes of secondary glaucoma. C. Primary angle-closure glaucoma. Primary open angle glaucoma. Secondary glaucoma. Mixed mechanism glaucoma.
Conclusions: Several differential diagnoses should be considered when confronted with a case of angle-closure.

D039 RESULTS OF PERIPHERAL IRIDOTOMY
R. Thomas, G.C. Shekar, R. Parikh
Hyderabad, India

Objective: To report the results of Laser Peripheral Iridotomy.
Main message: Having been shown to be equivalent, LPI has replaced surgical Iridotomy as the standard of care. The techniques (and lasers) used to achieve the Iridotomy vary and results are probably the same; however, the Nd-YAG LPI is probably the most popular technique today. The outcome of LPI depends on the stage of the disease as well as the mechanism. Acute Angle Closure Glaucoma (AACG): LPI has been shown to be effective in protecting fellow eyes from acute attacks; experts agree on its efficacy and safety in this situation. The outcome of LPI for IOP control in AACG itself is not impressive, varying from 41% in the milder cases to 6% of the severe cases. It would seem that most patients with AACG will require more than just an LPI. PACS (occludable angles): LPI's can be performed in a population based setting and do remain patent. About 22% of PACS are expected to progress to Primary angle closure (PAC) and very few are expected to advance to disc/field damage; fewer still to blindness. The Number Needed to Treat (NNT) is only five, but this is to prevent PAC, not damage (PACG), let alone blindness. The NNT to prevent PACG is 21. Even with the more aggressive nature of PACG, for prevention of blindness, the NNT will be much higher and over a much longer duration. Keeping this in mind, is it really necessary to (over) treat all PACS; especially since the long term effects of LPI on IOP and other possible side effects are still debated. The results of a study that screened a population and randomized the PACS to LPI versus no treatment are awaited. In addition to the effectiveness of LPI in PACS (and screening), the study should also provide valuable information about potential complications. PAC&G: LPI is currently standard of care for PAC. LPI does seem to prevent progression from PAC to PACG; the NNT of four is clinically significant (The NNT to prevent blindness would be higher). There is evidence in the literature for a higher success rate in PAC versus those who have disc/field damage (PACG). In 'early' PAC&G however, one study reported that 73% of angles could be opened and the IOP controlled with LPI alone. There was no difference between those with or without disc and field changes. Medical treatment was required to control IOP in 10%. Iridoplasty was needed to open the angle in 25% of cases; these were considered by the authors to be plateau iris. There was perfect concordance of results between the two eyes of patients who had a bilateral LPI; the result in one eye was predictive of the second.
Conclusions: 1. Prophylactic LPI is effective in fellow eyes of APACG; 2. LPI is the mainstay of treatment for AACG, PAC and PACG; 3. Success rates seem to decrease with increasing severity of disease (disc damage, moderate field defects); 4. Success rates also depend on the mechanism. Plateau iris will require further treatment to open the angle and control IOP; 5. The results and consequences of LPI for PACS are not clear.

D040 WHAT TO DO AFTER PERIPHERAL IRIDOTOMY?
P. Chew
Singapore

The problem of residual angle closure after an iridotomy in patients with primary angle closure glaucoma is a major issue. Often iridotomy in patients with asymptomatic chronic angle closure glaucoma does not lower pressure significantly in the majority of Asian patients. Additional medical therapy is needed and perhaps as many as a third of patients will require surgical intervention eventually. The evaluation of the angle after iridotomy does show that a proportion of patients, about a third, have elements of angle crowding that may benefit from additional laser therapy in the form of iridoplasty. I will show images of angles before and after iridoplasty using anterior segment OCT to demonstrate the different clinical behaviours of such patients. In symptomatic angle closure however, iridotomy is more effective in lowering IOP. Yet about 55% of patients will go on to develop chronically raised intra-ocular pressure. This pressure rise is asymptomatic with onset typically three to six months after the presentation of the acute attack. Various risk factors like presenting pressure and angle width post iridotomy are also significantly associated with the chronicity of pressure rise post iridotomy. There is a need to evaluate post iridotomy eye management critically in the light of this information.

D041 ACG TREATMENT OPTIONS
S. Friedman
Baltimore MD, USA

Objective: To review the evidence supporting various treatments for primary angle-closure glaucoma.
Main Message: Angle-closure glaucoma management is in evolution. Recent research indicates that both acute and chronic forms of the disease can be managed by multiple approaches. Some treatments, such as iridoplasty, are widely used, but very little is published showing its long-term effectiveness. Understanding the options for treatment and the need for further research will be the focus of this talk.
Conclusions: 1. Management of PACG is evolving; 2.Many strategies may be effective at preventing progression in persons with PACG; 3. More research is needed to help guide physicians caring for patients with PACG.

D042 A ROLE FOR CATARACT EXTRACTION?
D.S-C Lam
Hong Kong, China

Objective: To discuss the role for cataract extraction in the management of angle closure glaucoma.
Main message: During an acute attack of primary angle closure, immediate cataract extraction is technically challenging and carries significant risk of severe complications. However, once the intraocular pressure is controlled, cataract extraction may be the most effective means to open up the drainage angle, prevent recurrence of acute attack, and also prevent progression to chronic angle closure glaucoma. Timing of the cataract extraction is crucial. It may be safer to wait one month before performing cataract extraction, so that the inflammation and hemodynamics of the eye have largely stabilized and settled. In established and uncontrolled chronic angle closure glaucoma, lens extraction alone, especially by modern minimal-incision phacoemulsification techniques, can significantly improve intraocular pressure control, and possibly also prevent further closure of the angle. Ongoing randomized controlled trials will reveal whether combined trabeculectomy in the same setting will offer additional benefits.
Conclusions: 1. Removal of the lens alters many of the unfavorable ocular parameters that predispose an eye to angle closure; 2. Ongoing trials will likely confirm a therapeutic role for lens extraction in the management of both acute and chronic forms of angle closure glaucoma.

D043 CCT SHOULD BE MEASURED IN ALL PATIENTS
J.D. Brandt
Sacramento, CA, USA

Objective: To review the data supporting the recommendation that central corneal thickness (CCT) be performed in ALL patients.

Friday, July 8, 2005

Main message: The measurement of CCT became accepted as an important part of the glaucoma exam after the findings of the Ocular Hypertension Treatment Study (OHTS) that CCT was a powerful, independent predictor for the development of glaucoma among OHTS participants. Thus the most powerful support for integrating pachymetry into the ophthalmic exam is for ocular hypertensives. There is accumulating evidence to support routine pachymetry in all patients. This data will be reviewed.
Conclusions: 1. The strongest level of evidence (randomized clinical trials; RCTs) supports routine pachymetry among ocular hypertensives; 2. The next level of evidence (multiple case-controlled retrospective studies) supports pachymetry for newly-diagnosed and established glaucoma patients; 3. The growing population of patients who have undergone LASIK will dramatically affect our ability to perform accurate tonometry in the future; 4. A growing body of evidence supports the proposition that pachymetry become a routine part of the ophthalmic examination.

D044 CCT SHOULD NOT BE MEASURED IN ALL PATIENTS
M. Diestelhorst
Cologne, Germany

***Objective*:** According to the OHTS findings 'thin CCT' is believed to be a significant risk factor. Why? Patients with 'thin' corneas seemed to have progressed more often then other patients. CCT provides us with µm data from the centre of the cornea. The mean central corneal thickness of healthy eyes as measured in several clinical studies is in the range of 555 ± 40µm. CCT shows circadian variation and may be influenced with topical therapy. Different measurement techniques lead to different results. There is also variation of data when different equipment is used even from the same company by the same investigator. The CCT is just one parameter in the rather complicated formula of IOP calculation. How about curvature and rigidity in buphthalmos or Lasik/Lasek? The Goldmann Tonometer is calibrated for standard corneal thickness (520µm), standard radius of curvature (r=7mm) and also standard corneal 'rigidity'. GAT is based on the Imbert-Fick law. The four prerequisites of this law are not fulfilled by any living human eye: 1) the cornea is not ball shaped and perfectly spherical; 2) the surface is not an endlessly thin membrane without rigidity; 3) during applanation aqueous shifts to the trabecular meshwork and the posterior chamber; 4) tear film adhesion forces do occur during measurements. The Goldmann tonometer gives us only a hint of the intraocular pressure. There are numerous errors and adjustments which led to a reading precision in the range of ± 1 mmHg – that is 2 mmHg! In their original paper in Ophthalmologica in 1957 Goldmann and Schmitt mentioned that there are numerous possibilities for faulty readings. To date the observer-, eye related reading errors still seem to outweigh the equipment related one's by far: corneal astigmatism, ceratitis, scarring, ceratoconus, corneal surgery, microphthalmos, buphthalmos, nystagmus, blepharospam, chronic treatment with preservatives, blinking, ventilation, spread of fluorescein during measurements. Not to mention the inter-observer variabilities. In healthy eyes IOP varies ~ 6 mmHg and in glaucoma ~ 20 mmHg within 24 hours. We measure IOP for about two seconds every ~ 6 month (!) and claim to know the IOP of our patients – like in the OHTS study. It does not need a statistician to tell us that our knowledge of the IOP is very close to "0". However, based on these very few readings we decide upon the success or failure of medical treatment or surgery.
It seems like we tend to make the same mistake again we did when defining 'normal IOP' range. There was nothing but statistics to make us believe that 21 mmHg would be the cut-off line. Today we know better.
***Conclusions*:** 1. You do not need to measure CCT in all OH or glaucoma patients. You do not need to buy a pachymeter. Even if you should know the CCT of the eyes, do not feel safe or believe that you understand the IOP better than before and why the patients get worse. In the vast majority of patients it is about papilla and visual field, adherence to topical therapy and not 'thin CCT'; 2. Measure the IOP more often!; 3. We need to have an intraocular telemetric system to show us the real data we would like to discuss; 4. Hans Goldmann would go for it!

D045 DISC HEMORRHAGES ARE THE MOST IMPORTANT RISK FACTOR
K.I. Ishida
Gifu, Japan

Introduction: Disc hemorrhage (DH) at the optic nerve head is common in glaucoma. The prevalence of DH reported by previous investigators varies: 2 to 37% in patients with primary open-angle glaucoma, 20 to 46 % in NTG, and 0.4 to 10% in ocular hypertension. Obviously, DHs are observed more often in patients with NTG.
Objective: To investigate the relationship between DH and progression of NTG and to show topological relationship between the DH and visual field (VF) or nerve fiber layer defect (NFLD).
Methods: Study 1: We followed 70 untreated NTG patients with a mean follow-up period of 5.6 years, and applied a regression analysis of survival data based on the Cox proportional hazards model. Several clinical factors were investigated to find a possible association with the progression of VF defined by two different criteria: one by MD and the other by glaucoma change probability analysis. Study 2: Forty-two NTG patients developed new DHs were examined by SLO, to determine topographic correlation between DH and NFLD.
Results: Study 1: DH (RR=20.3 and 3.28 by the two definitions, respectively), age (RR=1.11), corrected-pattern standard deviation (RR=1.05 and 1.03 by the two definitions, respectively), systolic blood pressure (RR=1.03), and pulse rate (RR=0.95) had a significant influence on VF progression. The cumulative probability of VF progression was significantly greater for patients with DH than for patients without DH ($p<0.01$). All eyes that had at least two DHs progressed, whereas only 33% showed progression in the non-recurrent DH ($p<0.01$). Furthermore, 65 % of DH locations corresponded to the VF areas where progression was demonstrated. Study 2: Of the 64 DHs, 80 % of DHs occurred near the border of the retinal nerve fiber layer defect and adjacent to healthy-looking retina.
Main message: Although etiology of DH is still unclear, our studies indicate that DH is a distinct risk factor for VF progression in NTG and may be a sign of active process involved in the disease leading to progressive damage of the nerve fiber layer, which results in functional deterioration of VF.
Conclusion: DH is a significantly strong prognostic factor, especially in NTG.

D046 DISK HEMORRHAGES ARE NOT THE MOST IMPORTANT RISK FACTOR
P.J. Airaksinen
Oulu, Finland

Optic disc hemorrhages may be considered a risk factor in glaucoma. Some clinicians, however do not. They regard disc hemorrhages rather a sign of a sick optic disc, a sign of the disease. This because more often than not an optic disc hemorrhage is followed by a localized notch in the neural tissue of the optic disc. These matters, will be discussed in conjunction with other well known and important risk factors such as age, elevated IOP, myopia, pseudoexfoliation, family history, decreased perfusion pressure and others.

D047 SCREENING FOR POAG IS FEASIBLE
A. Heijl
Malmö, Sweden

Objective: To explain why and under what conditions that screening for POAG is feasible.
Main message: 1. Approximately half of all patients with manifest glaucoma, *i.e.* glaucoma with visual field defects on standard white-on-white automated perimetry, are undiagnosed in the Western world. 2. Many patients with undiagnosed glaucoma have considerable field loss, and a large percentage of glaucoma patients have serious field loss in at least one eye when first diagnosed. 3. Normal tension glaucoma is often, or maybe routinely, missed in ophthalmic clinical care. 4. Glaucoma damage may be easily recognized in a number of different ways aiming at identifying functional or structural defects. 5. Population screening for glaucoma must be highly specific in order to be feasible. 6. In population screening for glaucoma one must accept that some early glaucoma is missed. 7. Screening tests for population screening and the interpretation of such tests must be different than those tests and criteria applied in ophthalmic care, and they must be tested for that purpose. 8. Population screening should be targeted to well selected groups with reasonable risk for manifest glaucoma. Age is the most important factor. 9. Population screening for glaucoma must be carefully planned, and the drawbacks thoroughly considered before implementation. 10. Population screening is only possible if the legislation of the country is such, that a certain percentage of patients, particularly with early disease, can be missed without serious legal consequences.
Conclusions: POAG screening is possible, but such screening must be very carefully planned, make use of well tested methods and interpretation schemes that have been tested particularly in those groups that are targeted with the screening. Screening should not be applied indiscriminately, but to groups with reasonable risk for the disease.

D048 SCREENING FOR GLAUCOMA IS NOT FEASIBLE
R.P.L. Wormald
London, United Kingdom

Objective: To discuss the problems and difficulties in designing a glaucoma screening programme
Main message: These are numerous and include: Defining the disease; Defining the population at risk; Choosing the right tests; Defining the screening interval; Monitoring quality.
Conclusions: Screening for glaucoma is not infeasible but complicated.

10.30 – 12.00 am.

D049 EVIDENCE-BASED AND VALUE-BASED MEDICINE
R.P. Wilson
Philadelphia, PA, USA

Objective: Discuss the nature of the evidence ophthalmologists use to make patient care decisions, and present better approaches.
Main message: Although evidence-based medicine (EBM) was first described in 1981, ophthalmic journals have only recently started to incorporate its principles. Even the best American ophthalmic journals compare poorly with the American Journal of Cardiology with a preponderance of cross sectional studies, case series and case reports rather than the randomized controlled, controlled, and case controlled trials, and cohort studies that make up the majority of the American Journal of Cardiology. Busy ophthalmologists are forced to base their practices on a seriously flawed literature, or worse, and society is obliged to pay for ineffective practices. The responsibility continues to fall on the ophthalmologist to accrue the skills to identify which studies provide valid results and incorporate the findings into their practices. Unfortunately, the use of EBM by practicing ophthalmologists is minimal. The best estimate is that only between 10 and 35% of clinical care is based on the results of best evidence defined as randomized, controlled clinical trials. Another 15 to 40% is based on some degree of scientific evidence. However, 35 to 50% is based on individual perceptions, expert opinion, or uncontrolled biased case series. With the introduction of trade newspapers like Ocular Surgery News which are often biased and non-peer reviewed, and the influence of industry in research and ophthalmology meetings, these numbers may be slipping rather than improving. To best serve their patients, however, ophthalmologists have no choice but to learn to identify the studies on which to base their practice. Basic skills require the ability to ask these questions and understand the answers. Was the study a:systematic review of randomized controlled trials? single randomized controlled trial? controlled trial? cohort study? case-controlled study? cross sectional study? case series? case report? Clearly, the closer the type of study reported is to the top of this rank list, the stronger the evidence provided. Has bias and confounding been minimized? Bias is minimized if there are no differences between the patients asked to participate in the study and those who are not, and in those in the treated arm and the controls, if the number of patients lost to follow-up is small and the same between treatment and control arms, and both the patient and investigator are masked. Was the power of the study adequate? In other words, did the number of patients in each group allow the conclusion to be statistically significant? For example, among 71 negative trials reported in the New England Journal of Medicine, 67 had greater than a 10% risk of missing a 25% treatment improvement and 50 had a greater than 10% risk of missing a 50% treatment improvement. This means that therapies which were labeled 'no different' from controls did not receive a fair trial due to an inadequate number of subjects. Are the conclusions supported by the paper? In a surprising number of papers, the results section of the paper does not support the conclusions as the authors extrapolate beyond what their data would allow. Are the conclusions influenced by the funding source for the study? If ophthalmolo-

gists are able to ask these questions and discern the answers, they will be able to use the best evidence available to support their patients. Value-based medicine is the next step. Value is measured by objectively quantifying: 1) the improvement in quality of life and/or 2) the improvement in length of life conferred by an intervention. After factoring in the costs associated with an intervention, cost-utility analysis is used to prove the interventions sanctioned by EBM are cost-effective for society to implement.

D050 NEW INFORMATION FROM OHTS
R.K. Parrish
Miami, FL, USA

Objective: Describe the effect of IOP lowering in OHTS African American patients. Describe the effect of corneal thickness on efficacy of glaucoma medications. Describe the reproducibility of reading optic disc progression in the Optic Disc Reading Center.
Main message: The Ocular Hypertension Treatment Study continues to produce new results regarding the effect of IOP lowering in ocular hypertensive patients. Since 2002, additional findings regarding the treatment benefit in African American patients, the effect of central corneal thickness on IOP measurement, and the reproducibility of test-retest of optic disc grading by masked readers have been reported. Although African American patients benefited from IOP lowering by 20% to prevent progression to open angle glaucoma, (Hazard ratio = .50), the treatment effect was less than among other (non African American) patients, (Hazard ratio = .36). The magnitude of the IOP lowering effect of topical medication was inversely related to central corneal thickness. A study designed to test the reproducibility (sensitivity and specificity) of determining progression by the Optic Disc Reading Center demonstrated kappa values in the 'good' to 'excellent' range from years 2000-2004.
Conclusions: OHTS continues to provide new and important information to guide clinical decision making.

D051 WHAT DO WE LEARN FROM OHTS FOR OUR PRACTICE
P. R. Healey
Sydney, Australia

Objective: To assess how the Ocular Hypertension Treatment Study (OHTS) might influence the clinical practice of ophthalmology. The OHTS followed 1636 participants aged 40-80 years with ocular hypertension, randomised to pressure lowering medication or observation. It has provided insights into the natural history of ocular hypertension and the effects of IOP lowering medications. This review will examine: 1. the OHTS population and compare it to the population that we may find in our own practices; 2. the utility of risk factor analysis in ocular hypertension; 3. the role of assessment including IOP, CCT, optic disc photography, HRT and visual field testing; 4. the effects of treatment; OHTS outcomes and their relationship to glaucoma diagnosis.

D052 NEW INFORMATION FROM EGPS
S. Miglior
Monza, Italy

Objectives: To report the predictive factors of primary open angle glaucoma (POAG) in patients affected by ocular hypertension (OHT) enrolled in the European Glaucoma Prevention Study (EGPS).
Main message: In univariate analyses, baseline factors that predicted the development of POAG included older age, higher IOP, larger vertical c/d ratio, larger vertical c/d ratio asymmetry, higher pattern standard deviation (PSD), thinner central corneal thickness (CCT), pseudoexfoliation (PEX) and cardio-vascular diseases. In multivariate analyses, when adjusting for mean IOP reduction during the follow-up, baseline factors that predicted the development of POAG included older age, larger vertical c/d ratio, larger vertical c/d ratio asymmetry, higher PSD and thinner CCT. A smaller mean IOP reduction (throughout the follow up) from baseline was also associated with the development of POAG.
Conclusions: 1. Baseline age, vertical c/d ratio, vertical c/d ratio asymmetry, PSD and CCT were good predictors for the onset of POAG in the EGPS; 2. Central corneal thickness was found to be a powerful predictor for the development of POAG; 3. The results of the EGPS are in agreement with the findings of OHTS and EMGT and support the need for a global evaluation of the patients with OHT.

D053 WHAT DO WE LEARN FROM EGPS FOR OUR PRACTICE
K. Singh
Stanford, CA, USA

Objective: To Discuss the Impact of the Early Glaucoma Prevention Study on Glaucoma Practice.
Main message: While EGPS has added additional high quality evidence to the existing literature, limitations in the hypothesis, design, conduct and interpretation of the study have resulted in the study findings adding little to our overall understanding of glaucoma therapy.
Conclusion: The Early Glaucoma Prevention Study has had minimal impact on glaucoma practice.

D054 NEW INFORMATION FROM EMGT
A. Heijl
Malmö, Sweden

Objective: Update on current status of EMGT and its results.
Main message: 1. The three main objectives of EMGT have been met; 2. EMGT receives no more funding from NIH; 3. EMGT data are still analyzed and further publications can be expected; 4. The EMGT patient cohort is unique and will continue to be followed with a very different protocol and with support from the Swedish Research Council; 5. The goals for this second study of the same patient cohort are different, and are centred on quality of life and visual impairment; 6. The question of whether immediate treatment in newly detected early glaucoma is important for the patient remains crucial, and can only be finally answered by continued follow-up of this patient cohort; 7. To recruit patients for the study, EMGT was preceded of a very large population screening, Malmö Eye Survey; 8. Follow-up of patients in Malmö Eye Survey have recently shown: a. That exfoliation syndrome is an IOP-independent risk factor for glaucoma in patients with ocular hypertension; b. Mortality is the same in glaucoma patients as in subjects without glaucoma.
Conclusions: EMGT and studies related to EMGT continue to provide important data. The EMGT patient cohort is now followed with a different protocol and with quite different study aims. Continued follow-up of this cohort remains the only available opportunity to answer the crucial question of whether immediate treatment or waiting for progression makes any difference for the patient with newly detected early glaucoma.

D055 WHAT DO WE LEARN FROM EMGT FOR OUR PRACTICE
D.E. Grigera
Buenos Aires, Argentina

Objective: To bring to the attendees concise information from latest EMGT results, relevant for clinical practice.
Main message: Lowering IOP in an average of 25 % in newly diagnosed white OAG patients with early glaucomatous damage reduced in half the risk of progression at six years (hazard ratio = 0.50; 95% CI, 0.35-0.71). Progression was observed earlier and was more frequent in the control than in the treated group. The more the initial IOP was reduced, the better was the outcome. This is consistent with what has been observed for Ocular Hypertension in the OHTS. According to the authors' analysis, each lower millimeter of mercury of IOP on follow-up may be associated with an approximate 10% decrease of risk of progression. This may or may not be true in the 'real world', since the effect of IOP on ganglion cell function is non-linear and since there likely exists a threshold below which progression may not be distinguished from the aging effect. The number necessary to treat (NNT) was 5,9 (around one third of the calculated for OH in OHTS which is far more reasonable). Increased risk of progression in EMGT was associated with higher baseline IOP, exfoliation, bilateral disease, worse mean deviation, and older age, as well as frequent disc hemorrhages. This information opens the door for increasing the efficiency of our treatment by adjusting the individual target IOP according to the found risk factor. The average amount of visual field change (considering three consecutive visual fields) needed to meet EMGT visual field progression was a loss of about – 2dB in MD and an increase in about five highly significant points. This is information expressed in a practical, widely understandable way. The treated group had more nuclear lens opacities than the untreated, although by six years follow-up it had not affected vision.
Conclusions: 1. The magnitude of IOP reduction was the most important factor to slow or to stop progression in white patients with early damage from OAG; 2. Reducing IOP beyond 25% in a patient with the same profile seems reasonable; 3. Patients at increased risk of progression (high baseline IOPs, exfoliation, bilateral disease, a MD at first visit higher than –4dB), should be considered for a lower target IOP; 4. These patients should be submitted to a closer monitoring. Special structure and function test could also be applied; 5. To confirm functional progression: perform and consider at least three consecutive visual fields and pay special attention to MD and to points in pattern deviation probability map; 6. Remember: EMGT findings do not apply to the management of other patient groups, such as non-whites, patients with advanced field loss or with OH.
Whether cataract formation affects vision in the treated group in a longer follow-up remains to be seen.

D056 NEW INFORMATION FROM AGIS
P. Palmberg
Miami, FL, USA

The Advanced Glaucoma Intervention Study was a landmark study of the long-term outcomes of glaucoma interventions. Continuing analysis is yielding useful information about the pressure-dependence of glaucoma damage, risk factors for progression, how to distinguish progression from fluctuation, and about the long-term effectiveness and complications of filtering surgery and laser trabeculoplasty. AGIS was conducted from 1988 until 2003, following the outcomes of eyes randomized to initial laser trabeculoplasty or to glaucoma filtering surgery. Some 451 eyes of 332 black patients, 325 eyes of 249 white patients and 13 eyes of 10 patients of other races were enrolled. Race-treatment interactions were discovered part-way through the study for both the change in visual field and change in visual acuity, and persisted through the end of the study (8-13 years of follow up). At seven years, VF progression had occurred in black subjects in 25% after LTP first and 24% after surgery first, whereas in whites VF progression occurred in 34% after LTP first and 20% after surgery first. By ten years VF impairment comparable to legal blindness occurred in black subjects in 12% after LTP first and 18% after surgery first, and in white subjects in 10% after LTP first and 7% after surgery first. Visual acuity loss occurred more frequently with surgery in either race. The Investigators recommended that LTP precede resorting to surgery in black patients, but surgery be performed first in white patients. The recommendation was not widely accepted, because surgery was shown to increase the relative risk of cataract by 78% and it was found that the risk of glaucoma progression could be markedly reduced by either method so long as the IOP during follow up was under 18 mm Hg. Thus, LTP could be used first in either race, and then surgery performed if the treatment goal were not reached. Recently, further mining of the visual field information from the study has yielded several interesting findings. Risk factors identified for visual field progression (based upon point-wise linear regression) included larger IOP fluctuation (OR 1.31 for each mm Hg increase in IOP fluctuation), older age at entry (OR 1.30 for each 5 year increment in age), as well as increased number of glaucoma interventions and increased length of follow up. The problem of distinguishing progression from visual field fluctuation was addressed using the original criteria of change in AGIS units (correlates well with Mean Deviation on Humphrey Visual Field testing). When a visual field worsened by at least two AGIS units or two dB of MD and was confirmed on another field, the defect persisted during three years of follow up in 72% of cases, and after two confirmations the defect persisted in 84% of cases. In an analysis pooling the results for all subjects, a dose-response relationship was found between the percent of visits with IOP <18 mm Hg and visual field loss. In those subjects with all IOP < 18 mm Hg (mean IOP 12 mm Hg) there was no net visual field loss in eight years of follow up. In groups of subjects in whom the IOP was <18 mm Hg in 75-99%, 50-74%, and <50% of visits, respectively, progressively greater average VF loss occurred. In a study conducted in parallel to AGIS in Miami, 205 eyes with advanced glaucoma (mean MD -14.6 dB) underwent primary glaucoma filtering surgery with antimetabolites, with the mean IOP reduced from 26 to 11 mm Hg for 10 years of follow up. In this entire cohort there was no net visual field progression, demonstrating that the best group scenario of AGIS reflected a true pressure-dependence of glaucoma. Drawing upon its huge data base of 789 eyes carefully followed for up to 13 years, AGIS continues to provide useful insights into the outcomes of glaucoma interventions.

Friday, July 8, 2005

D057 WHAT DO WE LEARN FROM AGIS FOR OUR PRACTICE?
D. Minckler
Los Angeles, CA, USA

Objective: Brief summary of important clinical applications of AGIS-related publications now numbering more than 15.
Main message: AGIS has taught us that different outcomes should be expected by race for sequential laser and surgery interventions in glaucoma. According to AGIS publications 3, 4, 6, and 9 Argon laser-trabeculectomy-trabeculectomy (ATT) is relatively more effective in blacks than whites and trabeculectomy-laser-trabeculectomy (TAT) more effective in whites. Current application of these AGIS conclusions however should be integrated with medication and laser technology advances since their publication. Also it should be kept in mind that the original hypotheses for the study did not anticipate racial differences in outcomes subsequently derived from post-hoc analyses.
Conclusions: 1. The AGIS visual field scoring system has confirmed that serial automated perimetry is a reliable method of documenting progressive glaucoma injury; 2. AGIS confirmed the increased incidence of post-trabeculectomy cataract and that trabeculectomy works relatively well, even without antifibrotics; 3. AGIS data indicates that relatively low IOP levels (12-14 mmHg; AGIS #7) are protective against further visual field loss.

D058 ENVIRONMENTAL RISK FACTORS IN GLAUCOMA
P. Mitchell
Westmead, Australia
Objective: This paper aims: 1) To review known and hypothesised ocular, systemic and environmental risk factors for open-angle glaucoma, based on findings from the Blue Mountains Eye Study (BMES) and other large population-based studies of older populations and: 2) To document risk factors associated with elevated intraocular presure (IOP).
Main message: While genetic factors are likely to explain a large proportion of individual risk for open-angle glaucoma, including its age at onset, severity and specific optic disc characteristics, population-based studies in many countries have demonstrated a number of other variables that appear to be associated with an increased susceptibility of the optic nerve head to damage at prevailing or ambient IOP levels. Included are structural factors that could influence or may reflect risk of optic nerve head damage, such as myopia, peri-papillary atrophy (beta-PPA), pseudoexfoliation (PXF), optic disc haemorrhage, and optic disc size, together with central corneal thickness (CCT). The BMES odds for glaucoma in multivariate models were: 1) myopic refraction (at least 1 dioptre), a 2-fold risk; odds ratio (OR) 1.9 95% confidence interval (CI) 1.2-3.0; 2) beta-PPA, a 3-fold risk; OR 3.0 (CI 1.9-4.7); PXF, a 3-fold risk; OR 2.8 (CI 1.1-6.2) and optic disc haemorrhage, a 10-fold risk; OR 10.4 (CI 5.0-21.7). Identified systemic and environmental factors include diabetes, hypertension and, more recently, thyroid disease, particularly hypothyroid state. Although the magnitude of increased glaucoma risk associated with presence of systemic hypertension was relatively low in the BMES, the high community prevalence of elevated blood pressure, means that this factor may have a relatively high 'attributable' risk. The BMES odds for glaucoma in multivariate models were: 1) diabetes, a 2-fold risk; (OR) 2.0, (CI) 1.1-3.7; 2) thyroid disease, a 2-fold risk, OR 2.1 (CI 1.1-4.4) and 3) hypertension, an 80% higher risk, OR 1.8 (CI 1.2-2.7). Lifestyle factors did not appear to influence glaucoma prevalence. Many such ocular, systemic and environmental factors have also been shown to influence IOP. Most of these variables, however, have only a modest impact on IOP levels, with each typically associated with IOP differences of around 0.5 mmHg or less. In the BMES, blood pressure (BP), diabetes, myopia, thyroid disease, PXF, and current smoking were all significantly associated with modest elevations of IOP. Caffeine consumption was associated with slightly higher IOP levels in glaucoma cases. Our data indicate ambient BP as the principal systemic factor influencing measured IOP, with a similar magnitude to the variance associated with CCT; we found a 3.4 mmHg excursion in mean IOP over the clinical range of BP.
Conclusions: Many ocular, systemic and environmental factors appear to increase the likelihood of glaucomatous optic neuropathy (and IOP). Once underlying genetic factors are identified, it seems likely that gene-environment interactions will be important to identify in developing approaches to optimising the detection and management of glaucoma and elevated IOP.

D059 ALL GLAUCOMAS HAVE A PRESSURE COMPONENT
C. Burgoyne
New Orleans, LA, USA

Objective: To explain the biomechanical relationships between intraocular pressure (IOP) and IOP-related stress and strain within the optic nerve head (ONH) connective tissues.
Main message: Intraocular pressure related stress and strain are always present within the neural and connective tissues of the ONH. Their magnitude may be substantial even at low levels of IOP and may exceed the elastic limits of normal or damaged connective tissues at all levels of IOP. Elevated levels of IOP-related stress and strain may separately influence both the volume flow of blood within the peripapillary and laminar capillaries and the diffussion of blood borne nutrients from the laminar capillaries to the overlying astrocytes and adjacent axons. 'Glaucomatous' (in relation to the above concepts) is the name we give to the appearance the ONH assumes when its neural and connective tissues are damaged by IOP-related stress and strain, regardless of the actual mechanism of damage or the level of pressure at which that damage occurs.
Conclusions: IOP-related connective tissue stress and strain should be expected to effect the physiology and pathophysiology of the ONH astrocytes and axons at all levels of IOP.

D060 NOT ALL GLAUCOMAS HAVE A PRESSURE COMPONENT
J. Flammer
Basel, Switzerland

We all agree that an increased intraocular pressure is the main risk factor for glaucomatous damage. The fact, however, that the majority of patients with increased IOP will not acquire damage and that a large portion of patients with glaucomatous damage do have a normal IOP, indicates that other factors are involved as well. Furthermore, a number of patients progress despite a normalized IOP, sometimes even at a very low IOP. Among the many factors, the vascular factors seem to be most important. This assumption is supported by the fact that blood flow to the eye in majority of glaucoma patients is decreased, specially when challenged (see Course No 16). Furthermore, a number of different systemic alterations, such as *e.g.* low blood pressure at night, can be found more often in glaucoma patients than in non-glaucoma patients (see Course No 33). For most of the relevant factors, we do not yet know, how far they can lead to a glauco-matous damage by themselves and how far they rather increase the sensitivity to IOP and IOP fluctuation. Furthermore, at present we have only a few intervention studies, indicating that improving this factors may indeed improve prognosis. The lack of these studies, however, does not indicate that these factors are not important. In the future we may put much more emphases on these factors both for diagnosis and for treatment.

D061 GLOBAL GUIDELINES ON DIAGNOSIS AND TREATMENT
C.E. Traverso[1], J.M Liebmann[2]
[1]Genova, Italy; [2]New York, NY, USA

This is a time of rapid advancement in our understanding of glaucoma. This new information spans basic biology, epidemiology, disease detection, treatment, and new ways to preserve vision. We are fortunate that our electronic world allows for rapid transfer of information across borders and regions at a rapid pace. Undoubtly the digital age is having a huge impact on the detection of disease and the delivery of healthcare worldwide; standards of care and access to care however vary immensely among and within the various geographical areas. The purpose of these guidelines in to provide a foundation to help improve the ability of ophthalmologists to deliver quality care to our patients wherever they may be found. While global regional differences impact local health care delivery and we acknowledge that no single set of guidelines can be applied to every situation, we believe that the guidelines that follow provide a firm foundation for the enhancement of glaucoma care worldwide and have the potential to help reduce unnecessary blindness. Our goal is to help the patients. Global guidelines for any medical field are only a scaffold onto which regional, national or local guidelines should be applied. Any set of guidelines is by definition, a living document. We expect that this first set of global guidelines will evolve as our knowledge about glaucoma increases. We look forward to those advances.

10.30 – 12.00 am.

D062 RELATIONSHIP BETWEEN ANTERIOR AND POSTERIOR SEGMENT MORPHOLOGY AND PATHOPHYSIOLOGY
E. Lütjen-Drecoll
Erlangen, Germany

***Purpose*:** To better understand the pathophysiology of glaucoma diseases changes in the trabecular meshwork of eyes with primary open angle glaucoma (POAG) and pseudoexfoliation glaucoma (PEXG) were compared with changes in the optic nerve.
***Material and Methods*:** The morphology of the anterior and posterior eye segments of 36 eyes with POAG and 15 eyes with PEXG were evaluated qualitatively and quantitatively and the data compared with those of age matched controls.
***Results*:** The changes of the extracellular material in the TM of the glaucomatous eyes were significantly different between the two kinds of glaucoma diseases. In eyes with POAG there was a significant increase of the so called 'SD plaques', whereas in PEXG pseudoexfoliationsmaterial filled the subendothelial region of Schlemm's canal. The amount of PEX material in the TM correlated significantly with axon loss in the optic nerve in eyes with PEXG and the amount of 'plaques' with axon loss in eyes with POAG. The morphology of the TM changes was, however, completely different from the changes within the optic nerve. In most optic nerves of PEXG there was no PEX material within the nerve and in eyes with POAG there was no plaque-formation. The changes in the optic nerve were qualitatively similar within the two groups of glaucomatous eyes. Both optic nerves showed a fibrosis of the septae, capillary loss in the septae and a specific form of axon degeneration with little gliosis. In eyes with POAG the fibrosis and capillary loss was, however, significantly more pronounced than in PEXG eyes.
***Conclusion*:** The cause of TM changes in the two glaucoma groups seems to be different in the different kinds of glaucoma diseases. The similarity in optic nerve changes could be due to the increased pressure present in the eyes of both groups. The quantitative differences between the two groups of glaucomatous eyes point towards additional factors increasing susceptibility for IOP induced changes in eyes with POAG. It is hypothesized that these factors might participate in both TM and optic nerve changes in POAG eyes.

D063 THE MOUSE MODEL IN GLAUCOMA RESEARCH
J.G Crowston
La Jolla, FL, USA

Objective: To descibe current possibilities and future opportunities of the mouse model in glaucoma research.
Main message: The mouse eye shares a number of similarities with the human eye with respect to anatomy, physiology and aqueous humor dynamics. Furthermore, trangene technology has led to estalishment of naturally cccuring glaucoma models in the mouse and also permits evaluation of the consequences of single gene mutations on the pathophysiology and treatment of glaucoma. The development of techniques that permit the measurement of aqueous humor dynamics and retinal imaging in the mouse eye provide further opportunities for this model.
Conclusion: The laboratory mouse is likely to play an ever increasing role in glaucoma research.

D064 PREDICTICE DNA TESTING FOR GLAUCOMA
J.E. Craig
Bedford, Australia

Objective: Glaucoma is a complex genetic disease with contributions from multiple genes. The presentation seeks to summarize progress in understanding glaucoma genetics and examine current possibilities for genetic predictive testing for glaucoma using clinical examples. Obstacles and future possibilities will be discussed.
Main message: A number of genes for glaucoma have been recently identified including Myocilin, CYP1B1, Optineurin and very recently WDR36. The use of direct DNA testing currently offers the possibility of predictive (presymptomatic) testing in certain families. We have shown strong patient acceptance of this in the case of Myocilin. In areas with a high frequency of congenital glaucoma, prenatal diagnosis has been facilitated by the identification of CYP1B1. There are reported associations of genetic polymorphisms with glaucoma but few have been replicated in multiple populations and more research is required in this area.
Conclusions: 1. In carefully selected families with proven disease-causing glaucoma mutations,

predictive testing is already possible and there is good patient acceptance of this; 2. Currently funding of this testing is problematic; 3. At this time, the majority of unselected glaucoma patients have unknown genes / mutations and therefore more research is required for widespread applicability; 4. Great future possibilities exist for predictive testing and risk profiling for glaucoma as more genes and their significance are carefully studied in multiple populations, and the cost of genetic screening falls.

D065 DAUTOANTIBODY PROFILES IN GLAUCOMA
F.H. Grus
Mainz, Germany

Purpose: Although an elevated intraocular pressure represents the main risk factor, it cannot explain the glaucoma disease in all patients. Previous studies could provide hints for an involvement of autoantibodies in the pathogenesis of the disease. The aim of this study was to analyze the use of autoantibody repertoires for the diagnosis of glaucoma. Furthermore, we attempted to test the glaucoma-specificity of these antibodies comparing them to antibody repertoires found in retinal diseases and to confirm some of these reactivities by proteinchip analyses.
Methods: 430 patients were divided into four groups: healthy volunteers without any ocular disorders (n=150), patients with primary open angle glaucoma (POAG, n=100), normal tension glaucoma (NTG, n=80). To test the robustness of the glaucoma detection, in an additional procedure 100 patients with other ocular disorders (*e.g.* retinal diseases) were included in the non-glaucoma control group (CTRL2). All groups were matched for age and gender. The sera of patients were tested against Western blots of retinal and optic nerve antigens. The autoantibody patterns were digitized and subsequently analyzed by multivariate statistical techniques and artificial neural networks. Some of the antibody reactivities were confirmed using Seldi (surface enhanced laser desorption and ionization) mass spectrometry. Therefore, bioactivated chip surfaces (PS10, Ciphergen, Fremont, USA) and Protein-A beads were used to capture the antibodies against retinal and optic nerve antigens.
Results: All groups revealed complex autoantibody patterns against ocular antigens. Elevated and decreased antibody reactivates compared to controls could be found in glaucoma patients. The diagnostic power of this antibody approach for the diagnosis of glaucoma could be assessed by calculating receiver operating (ROC) curves. Including both healthy subjects and other retinal diseases, the artificial neural network could reach an area under curve (r-value, ROC-curve) of 0.91. The Seldi analysis could demonstrate significant differences ($P<0.05$) in the antibody reactivities between all groups according to the Western blot results.
Conclusion: Changes in the natural autoimmunity in glaucoma patients could be demonstrated again. The role of these antibodies remains unclear, but the decreased antibody reactivities might correlate with a loss of protection in autoimmune mechanisms.In this study, we could demonstrate that pattern matching algorithms such as artificial neural networks could be used to detect glaucoma based on autoantibody patterns specific for this disease. Furthermore, the glaucoma specificity of these antibody profiles could be proved by comparison to antibody profiles in patients suffering from retinal diseases.

D066 OXIDATIVE DAMAGE IN GLAUCOMA
G.T. Tezel
Louisville, KY, USA

Objective: Retinal ganglion cells (RGCs) have been shown to be susceptible to reactive oxygen species (ROS), and the survival of axotomized RGCs has been found to be critically sensitive to the oxidative redox state. Ongoing efforts aim to identify the importance of oxidative damage in glaucomatous neurodegeneration.
Main message: Growing evidence supports that oxidative damage is involved in the neurodegenerative process of glaucoma, which can be induced by elevated intraocular pressure and/or tissue hypoxia at the optic nerve head and retina of glaucomatous eyes. Our *in vitro* studies using primary cultures of RGCs provided evidence that the RGC death induced by different glaucomatous stimuli involves both receptor-mediated caspase activation and mitochondria-mediated caspase-dependent and caspase-independent components of the cell death pathway. In addition, these *in vitro* studies revealed that the caspase-independent component of mitochondrial cell death pathway involves the amplified production of ROS and that anti-oxidant treatment improves the survival of caspase inhibited RGCs. We also performed proteomic analysis to determine whether retinal proteins are oxidatively modified during glaucomatous neurodegeneration in ocular hypertensive eyes; and if so, what the targets are for protein oxidation in these eyes. Immunochemical detection of protein carbonyls using 2D-oxyblot analysis revealed oxidative modification of many retinal proteins in ocular hypertensive eyes. To identify specific targets of protein oxidation in the retina, peptide mass fingerprinting, peptide sequencing, 2D-western blot analysis, and immunohistochemistry were utilized. The identified proteins included glyceraldehyde-3-phosphate dehydrogenase, a glycolytic enzyme; hsp72, a stress protein; and glutamine synthetase, an excitotoxicity-related protein. Since GAPDH, hsp72, and glutamine synthetase are known to play important roles for cell survival and/or function in the retina, their free radical-mediated modification may result in impaired cellular homeostasis eventually contributing to neurodegeneration.
Conclusions: Thus, the evidence supporting the involvement of oxidative damage in glaucomatous neurodegeneration includes: (1) Amplified production of ROS in response to different glaucomatous stimuli, in vitro, as well as axonal injury, leads to RGC death; (2) Protein modification by ROS occurs to a great extent in the retina of ocular hypertensive eyes, in vivo; and (3) Anti-oxidant treatment provides neuroprotection to RGCs during glaucomatous neurodegeneration. These suggest that anti-oxidant treatment is a promising neuroprotective strategy to improve the survival of RGCs for the therapeutic gain of glaucoma patients.

D067 APOPTOSIS SIGNALING IN NEURONS
L. Levin
Madison, WI, USA

Objective: Review the primary mechanisms by which axonal damage signals apoptosis.
Main message: Retinal ganglion cell (RGC) death is the final common pathway for virtually all optic neuropathies, including glaucoma. In most cases the primary injury is to the RGC axon, but it is controversial how axonal damage eventually results in RGC death. One mechanism is neurotrophin deprivation, but it is unclear if this is a signaling mechanism in neurons after development. We examined the effect of acute axotomy on RGC survival, and found that certain reactive oxygen scavengers (ROS) prolong survival of acutely axotomized RGCs in vitro. In addition, there is a rise in superoxide anion after axotomy, leading to our hypothesis that ROS serve as intracellular signaling molecules for RGC death after axonal damage. Signficantly, this rise is neurotrophin-independent, suggesting parallel pathways for signaling apoptosis.
Conclusions: 1. ROS may be signals for axonal damage; 2. If ROS signaling is essential for RGC death after axotomy, then this could serve as a critical point for therapeutic intervention (neuroprotection)

D068 GENE DELIVERY IN EXPERIMENTAL GLAUCOMA
K.R.G. Martin
Cambridge, United Kingdom

Objective: To review the methods by which genes can be delivered to retinal ganglion cells. In particular, the use of adeno-associated viral vectors will be considered and the potential use of gene therapy in the future treatment of glaucoma and other optic nerve diseases will be discussed.
Main Message: Gene therapy techniques have great potential in the future treatment of glaucoma.
Conclusions: Human diseases with single gene defects such as Leber's hereditary optic neuropathy may soon be treated successfully by gene therapy, assuming that vectors continue to improve and are well tolerated in the human eye. Other optic nerve diseases such as glaucoma that do not have a single gene defect may also benefit from gene therapy to enhance RGC survival. In all cases, the risks of treatment will need to be balanced against the potential benefits.

We know the good, we apprehend it clearly.
But we can't bring it to achievement. Some
are betrayed by their own laziness, and others
value some other pleasure above virtue,

Euripides

Saturday, July 9, 2005

9.00 – 10.00 am.

D069 MECHANISMS OF ACTION OF GLAUCOMA MEDICATION
P. Kaufman
Madison, USA

All current glaucoma medications aim to reduce intraocular pressure, by the mechanisms indicated below:
Cholinergic agonists – CM contraction deforms TM, enhances TM outflow. b2-Adrenergic agonists – enhance TM outflow (cytoskeletal mechanism?), enhance uveoscleral outflow (relaxes CM, stimulates PG synthesis?). Prostaglandin F2a analogs – increases CM & scleral MMP synthesis, remodels ECM. b2-Adrenergic antagonists – affect ion transport, reduce aqueous humor formation. a2-Adrenergic agonists – inhibit aqueous formation,? increases uveoscleral outflow. Carbonic anhydrase inhibitors – inhibit aqueous humor formation. Cytoskeletal agents (in development) – alter TM geometry / flow pathways.
Additional medications under development seek to protect retinal ganglion cells and their axons independent of intraocular pressure.

D070 PROSTAGLANDINS ARE FIRST CHOICE
G.L. Skuta
Oklahoma City, OK, USA

Objective: To demonstrate the value of prostaglandin analogues as initial therapy in the treatment of glaucoma and ocular hypertension.
Main message: Prostaglandin analogues such as bimatoprost, latanoprost, and travoprost lower intraocular pressure (IOP) by approximately 30-35% and provide a sustained ocular hypotensive effect with once daily application. In comparison to other classes of agents, including nonselective beta-adrenergic antagonists, prostaglandin analogues also produce less diurnal IOP variation. Their mechanism of action of increasing aqueous outflow may help maintain IOP at steady-state levels and dampen IOP spikes. These agents are associated with a low incidence of topical allergies and a relatively low rate of discontinuation. Although their ocular side effects are well described, the use of prostaglandin analogues avoids the systemic side effects associated with topical beta-adrenergic antagonists, alpha-2 adrenergic agonists, and carbonic anhydrase inhibitors.
Conclusions: In summary, prostaglandin analogues represent the most effective choice for initial glaucoma therapy due to their: 1. excellent and sustained ocular hypotensive effect with once daily administration; 2. ability to maintain a relatively flat diurnal IOP curve; 3. mechanism of action: enhancement of outflow; 4. low incidence of topical allergies; 5. relative lack of systemic side effects.

D071 PROSTAGLANDINS ARE NOT FIRST CHOICE
Y. Kuwayama
Osaka, Japan

Objective: To verify whether beta-blockers can be still first choice in glaucoma treatment. I. Relative disadvantages of beta blockers: A. Systemic side-effects: 1. Pulmonary; 2. Cardiac: Oral Beta-blockers, however, are now known to improve heart function and prolong the lives of patients with chronic heart failure; 3. Depression and CNS; 4. Reduction in HDL level; 5. Masking hypoglycemic symptoms; 6. Sexual dysfunction. B. Effectiveness in lowering IOP: Less potential than prostaglandins. Circadian variation in IOP lowering effect. II. Relative advantages of beta-blockers: A. Favorable and well-known local side-effect profile: No iris color change, no skin discoloration, no eyelash growth. Quite important to the compliance; B. Effectiveness in lowering IOP: Usable in any type of glaucoma. Reducing peak circadian IOP; C. Convenience of use; D. Low cost; E. Good stability without need for refrigeration; F. Greater than 20 years of clinical experience.
The aim of glaucoma management is to maintain quality of vision and quality of life. Since rate of progression is usually slow, not all glaucoma patients need bearing long eyelash and darkened eyelid. I have argued that beta-blockers remain the good first choice in patients without obvious systemic contraindications to their use.

D072 IS THERE A PLACE FOR COMBINATION DROPS?
R. D. Fechtner
Newark, NJ, USA

Objective: Review the benefits and limitation of combination drops.
Main message: Topical medical therapy remains the first line of treatment in the management of glaucoma. Utilization studies and clinical trials have demonstrated that many patients with glaucoma require multiple medications to achieve adequate control of intraocular pressure. Fixed combinations of commonly used drugs have been developed, starting with epinephrine/pilocarpine and timolol/pilocarpine. In 1998, timolol/dorzolamide fixed combination was introduced. More recently latanoprost/timolol fixed combination received regulatory approval and was introduced in parts of the world. Other combination products have been studied in large registration trials and await approval. The obvious benefit to fixed combination therapy over concomitant therapy is convenience. Using a fixed combination reduces the number of bottles per day that patients have to keep up with. This, in turn may also reduce the number of drops per day, but unless the dosing frequency is also reduced, fixed-combination therapy doesn't always significantly impact quality of life. Cost is also a potential benefit for patients on fixed-combinations. For patients with prescription drug benefits who make a co-payment for each prescription filled, using a fixed combination can eliminate one co-payment. But for patients with no prescription drug benefit, branded combination therapy is often more expensive than concomitant generic therapy.
Conclusions: 1. The first consideration when contemplating fixed-combination therapy for patients should be: does the patient need two IOP-lowering medications?; 2. The second consideration should be: are all of the ingredients in the combination right for the patient? Patients on multiple drugs may benefit from the convenience of fixed-combination therapy, but the combination should be used only if the patient's ideal treatment regimen would include the constituent drugs separately; 3. Fixed combinations offer benefits of convenience, cost, and safety, but limit individualization of dosing. Understanding the advantages and disadvantages of prescribing fixed combinations facilitates success in using these products in clinical practice.

D073 MAXIMUM MEDICAL THERAPY
S.A.G. Gandolfi
Parma, Italy

Objective: The presentation will try to offer criteria for (a) defining, (b) planning, (c) individualizing, (d) monitoring and (e) withdrawing a maximally tolerable medical therapy in 2005.
Main message: MTMT is the most aggressive medical approach to glaucoma. Several classes of compounds (combos included) are presently available. Drugs with complimentary mechanisms of action are likely to offer the best risk-efficacy profile. However, the efficacy of the proposed schedule must be weighed against (a) feasibility , (b) impact on Q.o.L., (c) long-term local and systemic toxicity and (d) the risk-benefit profile of surgery in the individual eye.
Conclusions: The best medical therapy, when not feasible, becomes the worst possible therapy in chronic glaucoma (!).

D074 TARGET IOP IS USEFUL
C.S. Migdal
London, United Kingdom

Objective: To discuss how the target IOP concept fits into the scheme of active management of the glaucoma patient.
Main message: Target intraocular pressure (IOP) is defined as an estimate of the mean IOP obtained with treatment that would be expected to prevent further glaucomatous damage. This level is obviously chosen from experience and uses the outcomes of clinical trials for guidance. The target pressure is selected after individual patient assessment and may need to be adjusted during the course of follow-up, depending on whether visual function is maintained, or continues to deteriorate.
Conclusion: 1. The aim of treatment need not be no progression at all, but rather a reduction of the rate of progression to such a level that functional vision is not endangered during the patient's lifetime. 2. The target IOP concept is now generally accepted as a useful guideline on which to base the active management of the glaucoma patient.

D075 TARGET IOP IS NOT USEFUL
J.C. Caprioli, F. Badala
Los Angeles, CA, USA

Objective: To support the argument that target pressures are not useful in glaucoma management.
Main message: Different methods for estimating target pressures have been proposed; none have proven accurate or effective. There is no evidence to support the use of target pressures. Still, a widely accepted approach is as follows: the more advanced the glaucomatous damage, the lower the target pressure. Whether patients benefit from IOP lowering as a function of the stage of their disease remains controversial. Previous investigations have shown a positive correlation, a negative correlation, or no correlation between baseline VF damage and risk of subsequent VF worsening. Our analyses on a selected population of the AGIS showed no convincing evidence for establishing target pressures as a function of baseline glaucomatous damage (no significant interaction between mean IOP and baseline mean deviation).
Conclusion: Target pressures are hypothetical and have not been shown to be effective. IOP (mean and fluctuation) is a well established risk factor for glaucoma progression. Therefore it seems reasonable to strive for a low and constant IOP, compatible with the quality and extent of the patient's life.

9.00 – 10.00 am.

D076 WHAT IS THE EVIDENCE TO SUPPORT GLAUCOMA NEUROPROTECTION?
L.A. Wheeler, E. WoldeMussie, W. Hare
Irvine, CA, USA

Objective: A chronic progressive loss of retinal ganglion cells (RGCs) is responsible for vision loss in glaucoma. A growing understanding of mechanisms associated with injury and death of neuronal cells provides new targets for drug discovery and therapy. Animal models of experimental glaucoma lead to selective loss of RGCs. Possible mechanisms to explain the progressive loss of RGCs in human glaucoma and experimental models are: glutamate excitotoxicity; loss of trophic factors; toxic insults mediated by nitric oxide and reactive oxygen species, etc. All of these mechanisms can drive apoptotic death of RGCs. Apoptosis is a genetically controlled process involving genes that either induce cell death pathways or increase cell survival pathways. Brimonidine, a selective alpha-2 agonist, and memantine, an NMDA antagonist were used as pharmacological probes to modulate survival in chronic ocular hypertension.
Methods: Experimental ocular hypertension was induced by laser in rats (WoldeMussie, IOVS, 2001) and primates (Hare, IOVS, 2002). Drugs that upregulate intrinsic survival pathways or block death signals were tested in the above models of experimental glaucoma.
Main messages: 1. Activation of alpha-2 receptors protects RGCs in chronic ocular hypertension. 2. Normalization of GFAP expression, upregulation of bcl-xl and activation of Akt are examples of brimonidine-induced activation of intrinsic survival pathway(s). 3. Oral memantine was able to reduce ocular hypertensive injury in rat and primate models suggesting a role for a glutamate-mediated injury in these models. 4. Treatment of primates with oral memantine for 15 months was not associated with any effect on the normal function of the retina and central visual pathways as measured by ERG and visually-evoked cortical potential (VECP), respectively.
Conclusions: Drugs targeting the pathways of stress, injury and death of RGCs can protect them from chronic ocular hypertensive insult. Neuroprotection provides a direct means of protecting RGCs from a wide range of insults in addition to IOP lowering.

D077 YES, THERE ARE OTHER WAYS TO TREAT GLAUCOMA
L. Levin
Madison, WI, USA

Objective: Argue that treatments other than lowering the intraocular pressure are likely to be effective for treating glaucoma.

Saturday, July 9, 2005

Main message: Review the animal studies for neuroprotection, then describe the clinical trials in progress or recently completed that test neuroprotection in glaucoma.
Conclusions: 1. Glaucoma is a disease where the visual loss results from dying retinal ganglion cells and their axons; 2. Protecting retinal ganglion cells is called neuroprotection; 3. Protecting retinal ganglion cells makes sense for glaucoma, if clinical trials are supportive.

D078 THERE IS NO OTHER WAY TO TREAT GLAUCOMA
H. Tanihara
Kumamoto, Japan

Objective: To review current studies for the development of neuroprotective therapy for glaucoma.
Main message: Intraocular pressure (IOP)-lowering therapy has been the most reliable modality for the inhibition of the onset and progression of glaucomatous optic neuropathy (GON). Some randomized clinical trials showed the evidence for the usefulness of this therapeutic concept. On the other hand, at present, many IOP-independent risk factors (including aging, immune reaction, ischemia, genetic background and glutamate metabolism) have been identified for glaucoma. Also, some investigations suggested that pharmacological modulation of these factors inhibit the progression of GON. Although numerous drugs have been regarded as promising candidates for neuroprotective therapy, from the viewpoint of evidence-based medicine (EBM), so far, there has been no reliable data on neuroprotective therapy for glaucoma.
Conclusions: Further studies will be required for the clinical application of therapeutic concept of 'neuroprotection.' Until then, IOP-lowering is the most reliable and useful treatment for inhibition of the onset and progression of GON.

D079 ALT AND SLT ARE THE SAME
L.J. Katz
Philadelphia, PA, USA

The similarities between argon laser trabeculoplasty (ALT) and selective laser trabeculoplasty (SLT) will be detailed. The lasers are different wavelengths and one is a continuous duration (argon) and the other a pulsed system (YAG). There is less of a thermal effect to the surrounding tissue with the selective laser, a frequency doubled Nd YAG laser. However, the mechanism of IOP reduction with laser trabeculoplasty has been postulated to be via enhanced aqueous outflow through the trabecular meshwork. Both ALT and SLT are thought to share this effect. There may be a cascade of biological steps leading to the improved aqueous outflow: enothelial cell proliferation, macrophage recruitment, and biochemical release (*e.g.* cytokines).
In addition the efficacy in treating glaucoma appears comparable whether it is adjunctive therapy when medications are ineffective or as a primary intervention. The IOP reduction may not be apparent until 4-6 weeks after the laser treatment with either ALT or SLT. The benefit may be transient with a return to the pretreatment baseline IOP. A post-laser IOP spike is a recognized potential complication following application with either laser system. The risk appears to be higher in eyes with heavily pigmented angles such as seen in patients with pigmentary glaucoma. There may potentially be a role for repeat SLT whereas repeat ALT has proven to be disappointing.
Conclusions: 1. Despite different laser specifications ALT and SLT are alike in their mode of action and have comparable clinical efficacy; 2. The risk of post laser IOP spikes exists with both ALT and SLT; 3. There may be a potential role for repeat SLT unlike ALT.

D080 ALT AND SLT ARE DIFFERENT
D. Realini
Morgantown, WV, USA

Objective: To describe clinically-relevant differences between argon and selective laser trabeculoplasty.
Main message: The mechanism of intraocular pressure (IOP) reduction is unknown for both ALT and SLT. Both stimulate an inflammatory response characterized by the production of cytokines. This inflammatory response may mediate the IOP reduction observed after treatment. Structural damage to the trabecular meshwork occurs with both lasers, but is far more extensive with ALT than SLT. This photocoagulative damage likely does not contribute to IOP reduction, and is thus an unnecessary byproduct of laser trabeculoplasty. More importantly, the cumulative meshwork damage resulting from serial trabeculoplasty treatments likely plays a role in limiting the repeatability of the procedure. SLT produces far less meshwork damage than ALT, and may thus be more repeatable than ALT.
Conclusions: 1. ALT and SLT likely lower IOP by similar mechanisms involving inflammatory mediators; 2. SLT causes much less photocoagulative damage to the meshwork than ALT; 3. SLT may be more repeatable by virtue of causing less meshwork damage.

D081 LTP SHOULD BE INITIAL TREATMENT OF OHT OR GLAUCOMA
G.L. Spaeth
Philadelphia, PA, USA

Laser Trabeculoplasty (LTP) is a highly useful treatment for some patients with glaucoma. It is, at present, largely underutilized. The reasons for this underutilization include the following: LTP is effective only in patients with primary open-angle glaucoma, pigmentary glaucoma and glaucoma in association with the exfoliation syndrome. It has been used (inappropriately) in other conditions and because it either does not work or causes an elevation of intraocular pressure (IOP) in those conditions some have concluded, incorrectly, that LTP does not work. The power needed to be effective needs to be adjusted depending upon the degree of pigmentation of the posterior trabecular meshwork. If attention is not paid to this the response is likely to be excessive or insufficient. Laser energy applied to the angle can cause glaucoma and is an accepted way to produce experimental glaucoma. This fact may frighten those considering using LTP for therapy. But dose/effect considerations apply to all treatments: any treatment – even milk for gastric ulcer – can cause problems when used EXCESSIVELY. The Glaucoma Laser Trial (GLT) was a beautifully designed and executed controlled clinical trial demonstrating the safety and effectiveness of LTP. However, accompanying the initial publication was an editorial, by a highly respected glaucoma specialist, which strongly criticized the study. Unfortunately, the author of the editorial had misread the article, and further injected his own conservative bias into the editorial. The consequence was an inapopropriate reluctance to accept the findings of the GLT. Some criticize LTP because it does not last forever. But no treatment does. Its duration of action is somewhat unpredictable, but that is a concern for all treatments also. In actuality, the duration of action of LTP is – obviously – thousands of time longer than for any medicine, and can in some individuals last longer than a trabeculectomy. LTP requires gonioscopic competence, and, amazingly and sadly, many ophthalmologists are not expert gonioscopists. A recent survey of American ophthalmologists showed that less than 10% of new patients are gonioscoped, and that over 10% of ophthalmologists do not even gonioiscope new GLAUCOMA patients. Those not comfortable with gonioscopy are not (or should not be) comfortable performing LTP. LTP can cause a pressure spike of concern, especially in those with far-advanced glaucoma and poor control of IOP, and when used with excessive power. Proper attention to dosage and individualization of technique to match the patient makes this concern so small as to be unimportant. In the early days of using LTP this was a concern, but should no longer be. LTP is criticized by some because it is less likely to be successful the second time it is done. But this is true for many procedures, including trabeculectomy. Furthermore, it appears that this concern does not apply to LTP when performed with the Nd:YAG laser. In summary, there is no treatment in ophthalmology – with the possible exception of laser iridotomy – that has a more favorable risk/benefit ratio than Laser trabeculplasty. When used properly in the proper patient the risks of LTP are very close to zero, and the benefits are a clinically significant lowering AND stabilization of IOP that lasts for many years. LTP is a highly valuable treatment that deserves far more frequent use than at present.

D082 LTP SHOULD NOT BE THE INITIAL TREATMENT OF OHT OR GLAUCOMA
C.B. Camras
Omaha, NE, USA

Objective: To convince the audience that LTP should not be the initial treatment for OHT or glaucoma.
Main message: Unlike medical treatment for glaucoma, LTP induces irreversible structural changes in the outflow pathways. These changes eventually can lead to irreversible complications with acceleration and worsening of the glaucomatous disease process. LTP-induced complications include: acute IOP spikes which may cause further visual field loss including possible loss of central fixation; a sustained rise in IOP necessitating invasive surgery; formation of peripheral anterior synechiae (or even a membrane overlying the angle) leading to further compromise of the outflow pathway; persistent iritis; and corneal endothelial damage. The LTP-induced IOP reduction diminishes with time. Repeat LTP can lead to further damage in the angle.
Conclusions: 1. Compared with medications, LTP is less safe and efficacious over both the short and long term in glaucoma therapy; 2. LTP produces irreversible complications and problems not observed with medications.

Consensus Statements on Glaucoma Surgery – Open Angle Glaucoma

The abstracts for the Consensus session are in fact the Preliminary Consensus Statements which were discussed at the recent Consensus Meeting, with the exception of presentations by Professors Khaw and Shaarawy. They are the product of a cooperative effort by a number of experts in each topic group. Each presenter is co-chair of the group. The final Consensus Statements and – Reports will appear in the Consensus book soon to be published by Kugler Publications.

10.30 – 11.45 am.

D083 INTRODUCTION
R.N. Weinreb
La Jolla, CA, USA

Objectives: To summarize and discuss the consensus points obtained from the AIGS consensus meeting on surgery for open angle glaucoma that was held in Fort Lauderdale on April 30, 2005.
Goals of Glaucoma Care: 1. The goal of care for the patient with glaucoma is preservation of sufficient vision that the patient does not develop a glaucoma-related reduction in quality of life; 2. The means to achieve this goal are to reduce or eliminate the intraocular pressure (IOP)-related threat to vision.
Assumptions: 1. Every patient has a unique manifestation of disease and interaction between disease, treatment and quality of life; 2. There are no clearly defined and accepted rules to dictate when surgery is the appropriate therapeutic choice, but there are principles that guide this decision; 3. It is not possible to know *a priori* what level of IOP will be needed to substantially slow or halt glaucoma and preserve quality of life; 4. IOP lowering should provide risk reduction for the development or progression of glaucoma and is not, by itself, the goal of therapy.

D084 INDICATIONS FOR GLAUCOMA SURGERY
R.D. Fechtner
Newark, NJ, USA

1. The decision for surgery should consider the risk/benefit ratio**.** Although a lower IOP is generally considered beneficial to the eye, the risk of vision loss without surgery must outweigh the risk of vision loss with surgery. 2. Surgery for glaucoma is indicated when: a. Optimum medical therapy and/or laser surgery fails to sufficiently lower IOP; b. A patient does not have access to or cannot comply with medical therapy. 3. Clinicians should generally measure IOP more than once and preferably at different times of day when establishing baseline IOP prior to surgery. When IOP is markedly elevated, a single determination may be sufficient. 4. Progression of glaucoma, considering both the structural and functional integrity of the optic nerve, is clearly a threat to vision and strongly influences the threshold for surgery. 5. Ongoing care of the patient with glaucoma requires careful periodic evaluation of structure and function. 6. Efforts should be directed at estimating the rate or risk of progression. A greater rate or risk of progression may lower the threshold for surgery but must be balanced against the risk and benefits of surgery and the life expectancy of the patient. *Comment*: An elderly patient with slow progression may suffer no effect on quality of life during his/her lifetime. *Comment*: Advancing glaucomatous optic disc damage or retinal nerve fiber loss without detected visual loss is progression and can in certain circumstances be an indication for surgery. 7. Risk factors for progression of glaucoma are emerging from prospective studies. [AGIS-older age, lower education, male sex, diabetes; CNTGS-female sex, migraine; EMGT- high IOP, pseudo-

exfoliation, worsening visual fields during follow up, disc hemorrhage, advanced stage of disease] Presence of these risk factors may alter target IOP or lower the threshold to surgery. *Comment*: Fellow eye vision loss from glaucoma may lower the threshold IOP for consideration of surgery. It is not clear that it is a risk factor for threat to vision. *Comment*: Family history of blindness from glaucoma is not a known risk factor for vision loss, but such patients warrant close observation. 8. Primary surgery may be indicated on the basis of socioeconomic or logistic constraints. *Comment*: There is insufficient evidence to recommend primary surgery in all patients. 9. Patients who are unable or unwilling to use their medical therapy as prescribed represent failures of treatment efficacy and may need surgery to achieve consistent IOP reduction, even when isolated IOP measurements appears normal at office visits. 10.The extent and location of damage may alter the threshold for surgery. Patients with advanced damage or damage threatening central vision may require lower IOP than those with early disease.

D085 LASER TRABECULOPLASTY
D.S. Minckler
Los Angeles, CA, USA

1. Laser trabeculoplasty (LTP) with, diode, or frequency doubled Q-switched Nd:YAG are effective methods to lower IOP. 2. The principal indication for laser trabeculoplasty remains the failure of medical therapy to sustain acceptable IOP levels in adult eyes with POAG or intolerance of medical therapy. However, in appropriate cases LTP may be used as a primary therapy. 3. Although IOP lowering after LTP tends to wane with time, it may produce clinically significant IOP reduction in phakic eyes for up to several years *Comment*: LTP often is effective in pseudophakic eyes for up to several years. 4. Postoperative monitoring of IOP and follow up treatment of intraocular pressure spikes is appropriate. *Comment*: IOP spikes tend to occur within the first few postoperative hours. 5. Uveitis, ICE syndrome, congenital anomalies of the anterior chamber angle, and poor visualization of angle structures are contraindications for LTP, while age < 40 year, angle recession, traumatic glaucoma and high myopia are relative contraindications. 6. All commonly employed methods of LTP appear to be equivalent with respect to short-term side effects and IOP lowering. 7. There is longer follow-up data available for argon laser trabeculoplasty (ALT) than for selective laser trabeculoplasty (SLT). Randomized studies comparing these two modalities are not yet available. 8. Retreatment with ALT (applying additional laser spots to areas of the meshwork previously treated) is likely to be ineffective and perhaps detrimental. Although retreatment with SLT has a theoretical advantage, studies to prove this have not yet been reported.

D086 WOUNDHEALING
J. Crowston
La Jolla, CA, USA

1. Excessive healing at the conjunctiva-Tenon's fascia-episcleral interface is the major cause of inadequate long term IOP lowering after trabeculectomy. 2. Risk factors for scarring should be evaluated and documented in all patients prior to undergoing glaucoma filtration surgery. *Comment*: Conjunctival inflammation should be minimized prior to surgery. 3. The use of adjunctive antifibrosis agents should be considered in most patients undergoing trabeculectomy and should be titrated against the estimated risk of postoperative scar formation and estimated risk for postoperative complications. *Comment*: Although some patients may have a successful result without adjunctive antifibrosis use, there is no systematic method for identifying these patients. *Comment*: Different antifibrotic agents may be associated with different risks and benefits. MMC may be a more effective adjunct than 5FU but is associated greater complications. *Comment*: A large antifibrotic treatment area is desirable to achieve diffuse non-cystic blebs with a lower risk of discomfort and leakage. *Comment*: Complications related to the use of antifibrosis agents are usually related to excessive inhibition of wound healing, which may result in or prolong early (wound leak, hypotony, shallow anterior chamber, choroidal detachment, etc.) and late (hyptonony maculopathy, wound leak, and bleb-related ocular infection, etc.) complications. 5. Modern trabeculectomy techniques that include the use of lasered/releasable/adjustable sutures should be employed to minimize the complications of excessive filtration. 6. Early intervention (subconjunctival 5-FU and increased topical steroids) is recommended in eyes with evidence of active scar formation (conjunctival hyperemia and anterior chamber inflammation). *Comment*: Use of subconjunctival 5FU in eyes with a wound leak, corneal defect or ocular hypotony should be cautioned. *Comment*: Postoperative IOP elevation typically occurs after significant scarring has already taken place. As the scarring process might be slowed with additional measures, but not likely reversed, it is advised to intervene prior to an actual IOP rise, based on signs indicating the likelihood of an active scarring process. 7. Antifibrosis use is associated with enhanced bleb formation and lower intraocular pressure. However, they also have an increased long-term risk. *Comment*: It is essential to inform patients about the signs and symptoms of ocular infection and advise them that they should seek ophthalmological advice urgently, should they occur. Long term follow up of these eyes is advisable.

D087 THE FUTURE OF WOUND MODULATION
P.T. Khaw
London, United Kingdom

More recently we have better understood the healing response and have been able to manipulate this response by modulating the cell cycle, growth factors, extracellular matrix/cell relationships, and inflammation. This has led to healing after surgery that results in tissues with a much more normal morphology. This will enable us to achieve long term low teens IOPs associated with minimal long term glaucoma progression Beyond this, the ultimate aim of surgery in the 21st century will be combine advanced surgical techniques with strategies to regenerate tissues that have been damaged by surgery or disease.

D088 TRABECULECTOMY
J.M. Liebman
New York, NY, USA

1. Incisional surgery for glaucoma is indicated when medical therapy and/or laser fail to sufficiently lower IOP or the patient does not have access to, or cannot comply with, other forms of therapy. *Comment*: Primary surgery may also be indicated on the basis of socioeconomic or logistical constraints. 2. Trabeculectomy is the incisional procedure of choice in previously unoperated eyes. 3. Postoperative hypotony should be avoided and sequential IOP adjustment should be performed with suture modification. 4. Trabeculectomy provides better and more sustained IOP lowering than non-penetrating procedures. 5. Although adjunctive antifibrosis agents enhance the success of trabeculectomy, their risk/benefit ratio should be assessed for each individual patient prior to use. This applies to initial and repeat surgeries. 6. Preoperative conjunctival inflammation and postoperative conjunctival and intraocular inflammation should be suppressed vigorously with glucocorticoids. 7. Trabeculectomy success is highly dependent on postoperative care and management. *Comment*: Early recognition of postoperative complications and timely, appropriate intervention enhances the success rate of surgery and minimizes patient morbidity. 8. Patients that have had trabeculectomy should be warned of the signs and symptoms of late bleb-related ocular infection and should be counseled to seek immediate attention should these occur.

D089 HOW DOES NON PENETRATING FILTERING SURGERY WORK
T. Shaarawy
Geneva, Switzerland

Objective: The presentation focuses on evidence based knowledge as well as current hypothesis on mechanisms of function of non penetrating filtering surgery(NPFS)
Main message: There are several points of interest when studying the mechanisms of function of non-penetrating surgeries. Namely the removal of the inner wall of SC together with adjacent trabecular tissue, the aqueous humor flow through the trabeculo-Descemet's membrane (TDM), the aqueous resorption after its passage through the TDM, and the SC dilatation by viscoelastic injection.
Conclusions: NPFS targets the site of maximal obstruction to aqueous outflow, namely the inner wall of Schlemm's canal and the Juxtacanalicular trabeculum. The TDM offers resistance to aqueous humor outflow that allows for a slow decrease in IOP during surgery and will account for the reliable and reproducible IOP on the first postoperative day.

D090 NON PENETRATING GLAUCOMA DRAINAGE SURGERY (NPGDS)
G. Carassa
Milano, Italy

1. Lower IOP can be achieved with trabeculectomy than with NPGDS. 2. Short-term complications associated with NPGDS may be fewer and less severe. 3. NPGDS is technically more challenging, with a longer operative time. *Comment*: Both procedures may require postoperative intervention.

D091 COMPARISON OF TRABECULECTOMY VERSUS NONPENETRATING GLAUCOMA DRAINAGE SURGERY (NPGDS)
I. Goldberg
Sydney, Australia

1. Lower IOP can be achieved with trabeculectomy than with NPGDS. 2. Short-term complications associated with NPGDS may be fewer and less severe. 3. NPGDS is technically more challenging, with a longer operative time. *Comment*: Both procedures may require postoperative intervention.

D092 COMBINED CATARACT AND GLAUCOMA SURGERY
G.A. Cioffi
Portland, OR, USA

1. A combined procedure is usually indicated when surgery for intraocular pressure (IOP) lowering is appropriate and a visually significant cataract is also present. *Comment*: Patients with glaucoma who are undergoing cataract do not necessarily require combined surgery. To avoid the complications associated with increased postoperative IOP, however, combined procedures should be considered in those patients on multiple medications or with advanced glaucomatous optic neuropathy. 2. The indication for combined surgery in an individual patient should take into account the level of desired IOP control after surgery, the severity of glaucoma and the anticipated benefit in quality of vision after cataract extraction. *Comment*: Visual rehabilitation may take longer following combined surgery compared to cataract surgery alone. 3. There is limited evidence to differentiate a one-site *vs.* a two-site approach for combined surgery. Therefore, surgeon preference and experience will dictate the choice. 4. There is limited evidence to differentiate a limbal vs. a fornix-based conjunctival incision for combined surgery. Therefore, surgeon preference and experience will dictate the choice. 5. Mitomycin-C should be considered in all combined procedures to improve the chance of successful IOP control, unless there is a clear contraindication for its use. *Comment*: Evidence for the use of adjunctive 5-fluorouracil data is limited and the bulk of the evidence suggests that it does not work well or at all. 6. Combined procedures are less successful for IOP reduction than trabeculectomy alone. *Comment*: subsequent cataract surgery may compromise the success of earlier trabeculectomy surgery. 7. In patients with cataract and stable glaucoma, a clear corneal approach is preferable in patients who may require subsequent trabeculectomy.

D093 GLAUCOMA DRAINAGE DEVICES (GDD)
A.L. Coleman
Los Angeles, CS, USA

1. Glaucoma drainage devices are indicated when trabeculectomy is unlikely to be successful or because of socioeconomic or logistical issues. *Comment*: In some patients, GDDs should be considered for socioeconomic or logistic issues relating to safety, follow up care, etc. 2. The restriction of flow of aqueous humor from the eye is important in the prevention of immediate postoperative hypotony. *Comment*: GDDs that do not have mechanisms to restrict aqueous flow require a suture ligature or internal stent or other flow restricting mechanism. 3. In general, larger surface areas of the plate are associated with lower IOP. 4. Scar formation around the plate is the main cause of long-term device failure. *Comment*: Antifibrotic agents have not been shown to improve long-term success when used intraoperatively of postoperatively. 5. Pars plana positioning of a GDD should be considered in a patient with a prior pars plana vitrectomy or in patient in whom a tube cannot be safely inserted into the anterior chamber. 6. The preponderance of evidence addresses GDDs that drain to a posterior reservoir. *Comment*:Anterior drainage devices are under study. One should not extrapolate data from posterior drainage to anterior drainage devices.

DIDACTIC PROGRAM

Saturday, July 9, 2005

D094 COMPARISON MMC TRABECULECTOMY VS GLAUCOMA DRAINAGE DEVICES (GDD)
F. Grehn
Würzburg, Germany

1. Trabeculectomy with MMC is less expensive and requires less conjunctival dissection than GDD surgery. *Comment*: Cost of GDDs vary significantly throughout the world. 2. With increased conjunctival scarring, the success of MMC trabeculectomy is reduced. GDD surgery should be considered in patients with failed MMC trabeculectomy. 3. In general, lower IOP can be achieved with MMC trabeculectomy compared with GDD, but good clinical studies are lacking. *Comment*: There is currently no prospective randomized comparison between MMC trabeculectomy and GDD. To adequately compare MMC trabeculectomy with GDD, comparable patient populations are required. 4. Bleb related complications are less prevalent after GDD surgery. However, GDD surgery introduces a distinct set of complications including tube erosion or plate erosion, endothelial decompensation and strabismus. 5. GDD surgery should be considered in patients at high risk of MMC-related postoperative complications. These include severe lid margin disease, chronic contact lens wear, and a history of blebitis or bleb-related endophthalmitis.

D095 CYCLODESTRUCTION
D.S-C Lam
Hong Kong, China

1. Of the cyclodestructive procedures, laser diode cyclophotocoagulation, with the G-probe, is the procedure of choice for refractory glaucoma when trabeculectomy and drainage implants have a high probability for failure or have high risk of surgical complications. 2. Transscleral cyclophotocoagulation may be considered when maximal medical therapy, trabeculectomy or drainage implant surgery is not possible due to resource limitations. 3. Prior to transscleral cyclophotocoagulation treatment, transillumination of the globe to reveal the location of the ciliary body may be useful, especially in morphologically abnormal eyes. 4. Post-operative treatment consisting of topical steroids and cycloplegics is suggested to minimize post-operative complications and discomfort. *Comment*: The effectiveness of treatment should be assessed after 3-4 weeks, at which time re-treatment may be considered. *Comment*: less intense laser therapy on a repeated basis rather than a single high dose treatment is suggested to minimize complications of treatment.

D096 COMPARISON OF GLAUCOMA DRAINAGE DEVICES VERSUS CYCLODESTRUCTIVE PROCEDURES
K. Singh
Stanford, CA, USA

1. Mechanism of action: a. Glaucoma drainage Devices (GDD) increase aqueous humor outflow; b. Cyclodestructive procedures reduce aqueous production. 2. GDD implantation requires greater surgical training and is a more extensive procedure than cyclodestruction. 3. GDD implantation requires greater postoperative care than cyclodestruction. 4. GDD implantation should be performed in an operating room while cyclodestruction can be performed in the office, minor surgery area or in the operating room. 5. The marginal cost of GDD implantation is more expensive than cyclodestruction. The initial cost of cyclodestruction related to the purchase of the device used for the procedure may be greater than that with GDD implantation. 6. Preoperative visual acuity may impact which of these two treatment modalities are preferred. All other things being equal, GDD are more commonly used for patients with better visual acuity and/or visual potential relative to cyclodestructive procedures. Strong evidence in support of this practice is not currently available.

10.30 – 12.00 am.

D097 VISCOCANALOSTOMY
G. Carassa
Milano, Italy

Viscocanalostomy is a non-penetrating glaucoma operation that was devised to restore a normal aqueous outflow through physiological pathways. Recent studies demonstrated that viscocanalostomy produces specific modifications in the wall of Schlemm's canal with increased outflow, even though diffusion in the suprachoroidal and subconjunctival spaces is possible as well. In order to get satisfactory and repeatable results, the technique must be as refined as possible. The internal scleral flap dissection need to be deep in order to provide a clean opening of Schlemm's canal. In order to minimize trauma and scarring, the injection of high molecular weight viscoelastic substance in the ostia of Schlemm's canal must be very delicate and must be repeated gently 7-8 times per part during the procedure. Ultrasound biomicroscopy can be of great help in investigationg the architecture of the surgical site, both preoperatively and most of all postoperatively where it can clarify the need for adjunctive manouvers.

D098 DEEP SCLERECTOMY
A. Mermoud
Lausanne, Switzerland

Objective: Deep sclerectomy was developed in order to decrease the immediate post-operative complications of filtering surgery.
Main message: With now 15 years of experience, the following principles have been achieved: 1. unanimous recognition of decrease in the number and severity of post-operative complications. 2. similar IOP reduction if the surgery and the follow-up are correctly performed meaning that the deep sclerectomy is dissected in the right depth and that the trabeculo-descemet's membrane is dissected at the exact plane, that goniopunctures are made if necessary in the postoperative follow-up. 3. the advantage of several aqueous resorbtion mechanisms. In trabeculectomy, we believe that there is only a sub-conjonctival bleb. In deep sclerectomy there is also a subconjonctival bleb but it has been shown that there is also an intra-scleral bleb as well as uveo-scleral outflow through the remaining scleral layer in the deep sclerectomy bed and direct passage into the Schlemm's canal, especially in viscocanalostomy.
Conclusions: Deep sclerectomy offers similar results in terms of intraocular pressure as the classical trabeculectomy with a reduced number of post-operative complications and several outflow mechanisms which decreases definitely the size of the subconjunctival bleb leading to less late post-operative complications such as bleb discomfort, bleb leak and bleb related infections.

D099 LIMBUS-BASED TRABECULECTOMY
R.P. Wilson
Philadelphia, PA, USA

Objective: Teach principles of limbus-based conjunctival flap creation.
Main message: Short and long-term success of filtering surgery depends upon the integrity of the conjunctiva overlying the scleral fistula and minimization of local fibrosis. Conjunctiva should always be handled meticulously and atraumaticly. The conjunctiva overlying the fistula should never be touched and non-toothed forceps used elsewhere, holding on to the Tenon's capsule rather than conjunctiva where possible. A 23-gauge needle-tip cautery is helpful in preventing conjunctival burns that result in weakened areas prone to later leaks. A traction suture is essential to infraduct the globe so that the conjunctival incision can be placed as far in the superior fornix as easily accessible. A 4-0 silk suture placed under the superior rectus as far as possible from the limbus or a 6-0 corneal traction suture with side-cutting needle (eg. 6-0 Vicryl on an S-29 needle) can be used. The first incision with Wescott scissors should be made at least 10 mm posterior to the limbus taking care not to injure the underlying superior rectus. The incision is extended circumferentially for 10 to 15 mm. If the incision is to be closed in one layer, the Tenon's capsule is incised down to bare sclera directly beneath the conjunctival incision. If a two-layer closure is desired, the Tenon's incision is 1 to 2 mm closer to the limbus. Since conjunctiva is more elastic than Tenon's, the Tenon's incision should extend for 1 – 2 mm further out under the conjunctiva to give more limbal exposure with a shorter conjunctival incision. Anterior dissection of the conjunctival-Tenon's flap must be done carefully to avoid buttonholes. Flap creation is done with blunt and sharp dissection using the Wescott scissors till the attachment of Tenon's at the limbus is reached. Blunt dissection using a cellulose sponge or cotton-tipped applicator is the safest way to move the conjunctival-Tenon's attachment as far forward as possible. The anterior dissection must be far enough forward to allow access to clear cornea under the scleral flap. However, retaining Tenon's attachment to the limbus provides relative protection against late-term conjunctival leaks and blebitis. Young patients, especially those with extremely thick Tenon's, may require forward dissection using a blade (eg. 67 Beaver) using first a forward scraping motion or, if that is unsuccessful, a cut-scrape movement with the blade held at 45 degrees to the limbus. A meticulous closure of the conjunctival-Tenon's flap is essential to a complication-free post-operative period. If the original incision is sufficiently far from the limbus, small initial leaks are of only minor concern as the raw surfaces of episclera and Tenon's are kept apart by a layer of aqueous and will be slower to fibrose together. If the incision is close to the scleral fistula and there is a leak, then aqueous escaping from the eye will immediately exit through the leak allowing the two raw surfaces to come into contact. In the reactive post-operative eye, they will quickly scar together eliminating any space for a bleb to form once the incisional leak closes. Closure can be with a single unlocked layer of 10-0 nylon on a cutting needle (my preference) or 9-0 polyglactin, or with a two-layer closure of 9-0 polyglactin or fine, long-lasting absorbable suture of your choice. If a two-layer closure is chosen, the Tenon's layer is closed with a running locking suture and the conjunctival layer with a non-locking suture. Some surgeons prefer a vascular needle when dealing with the conjunctiva. In comparison to fornix-based conjunctival-Tenon's flaps, limbal-based flaps minimize the worry of conjunctival leaks in the post-operative period but result in more localized blebs that increase the risk of late-term leaks and endophthalmitis.
Conclusion: Adherence to the above principles maximizes success and minimizes complications with limbal-based conjunctival-Tenon's flaps.

D100 FORNIX-BASED TRABECULECTOMY
P. Palmberg
Miami, FL, USA

A 180 degree fornix-based conjunctival flap is begun with a relaxing incision at the lateral limbus. Blunt Weskott scissors are passed posterior to the Tenon's capsule insertion to enter the sub-Tenon's space, with care to hover above the scleral surface so as to avoid injury to vessels on the scleral suface. Tenon's insertion runs from 10 to 2 o'clock. It is important to shear Tenon's capsule at its insertion and not to create radial tears in it, since Tenon's tissue will provide the belt-like structural support for the eventual water-tight closure of the filtering bleb. In addition, when the Tenon's tissue is bluntly dissected intact, almost bloodless surgery can be performed. After shearing the conjunctival and Tenon's tissue at their insertions and performing a relaxing incision nasally, blunt dissection is also carried out in each superior quadrant to the side of the superior rectus muscle. A two-thirds thickness 3 mm groove is then cut with a miniblade at 12 o'clock at the back of the limbal blue. A temporal paracentesis is placed and the eye slowly decompressed, if indicated. Three thin pieces 6 mm in length are then cut from the edge of a Weckcel sponge and hydrated with 0.4 mg/ml of Mitomycin C. They expand to 6 x 4 x 1 mm each. One is placed to each side of the superior rectus and the third at 12 o'clock, and the conjunctiva-Tenon's flap gently draped over the sponges for 2 minutes in a primary case, and up to 5 minutes for a combined or complex filter. The sponges are then removed and irrigation performed with 10-20 ml of saline, with care not to hydrate the Tenon's tissue (which would prevent further removal of free drug). A crescent knife is then used to tunnel 2 mm forward in the groove, and the anterior chamber entered with a microblade or keratome. A 0.75 mm Kelly Decemet's punch is then used to form a canal within the tunnel that ends about 0.5 mm short of the tunnel mouth. This forms a valve-like structure which will allow flow at about a pressure of 4-6 mm Hg. When such a valve is created, and the patient does not have blepharospasm, an iridectomy may be omitted. Theoretically, this should maintain an optimal flow of nutrients for the lens in a phakic eye, as opposed to creating a bypass (the iridectomy) of the pupil. The pressure at equilibrium flow should be determined by filling the anterior chamber with BSS through the paracentesis and watching until a steady flow is noted, and then pressing on the cornea with the bend of a 30 g canula. Two or more sutures are then placed in the mouth of the tunnel and their tension adjusted to yield a pressure of about 8-12 mm Hg at equilibrium flow. The conjunctiva is then closed with a series of buried 10-0 nylon mattress sutures, with purse-string sutures at the relaxing incisions. The needle passages through sclera enter perpendicular to the surface, turn abruptly to pass parallel the surface and then turn abruptly up to exit, so that 'square-wave bites' are taken. These will not loosen by clawing through the sclera as 'skimming' bites will. In addition, the bites of sclera should be as wide as the bites of conjunctiva-Tenon's tissue, so that the suture will not claw through the surface tissue over time. Tension must be built out along the limbus, spreading from the anchoring suture at 12 o'clock. At the end, the bleb is inflated by way of BSS placed in the anterior chamber, and tested for leaks. This procedure produces a scleral resistance set at the target pressure and uses MMC to inhibit the formation of additional resistance.

Saturday, July 9, 2005

D101 MANAGEMENT OF SMALL PUPILS
N. Pfeiffer, B. Dick, J. Wahl, A. Ahmadov
Mainz, Germany

Objective: To demonstrate methods how to deal with small pupils in glaucoma eyes undergoing cataract surgery. Many eyes with glaucoma have smaller than normal pupils. These include eyes with prior or present miotic therapy, pseudoexfoliation and many other secondary glaucomas. We demonstrate different methods to overcome this challenge in coexisting cataract necessitating cataract surgery. Any miotic therapy is discontinued. Preoperative dilatation is performed with adrenergics and parasympatholytics. Intraoperative suprarenin is often helpful. Any posterior synechiae are gently detactched using viscoelastics. Often the inner margin of the pupil can be stripped off fibrosed tissue allowing the pupil to dilate further. Additional stretching of the pupil in opposite directions dilates the sphincter muscle. Iris hooks have the advantage of keeping the pupil wide but need to be introduced at the expense of time and possibly release of fibrin. Iridotomy and resuturing of the iris is rarely necessary. Using these methods cataract surgery is possible in virtually all glaucoma eyes.

D102 ZONULAR LAXITY/DEHISENCE
I.K. Ahmed
Mississauga, Canada

Objective: To review latest techniques and devices in the management of cataract with zonular laxity.
Main message / conclusions: 1. Phacoemulsification and endocapsular PCIOL should be the treatment of choice for the cataract with any degree of zonular laxity, but requires specialized techniques and/or implants; 2. Phaco technique should be a low-flow, low-vacuum, supracapsular approach +/- vitreous management as required; 3. Capsular Tension Rings (CTR) should be used within an intact capsular bag for mild/moderate zonular weakness. Prophylactic use is questionable. Keep in mind, CTRs are useful intraoperative and postoperative zonular support devices, but do not recenter a dislocated cataract nor eliminate progressive zonulopathy; 4. Iris/Capsule Retractors and the Capsular Tension Segment (CTS) are useful and versatile for intraoperative zonular support of any severity; 5. Sutured devices, such as modified-CTR, or CTS should be used with profound zonular instability or large (>4 hrs) zonular dialysis with 9-0 polypropylene scleral sutures; 6. Postoperative vigilance is critical to treat anterior capsular contraction syndrome (*i.e.,* Nd:YAG anterior capsule relaxing incisions) and/or IOL decentration (suture repositioning).

D103 USE OF CAPSULAR TENSION RINGS IN GLAUCOMA
A.S. Crandall
Salt Lake City, UT, USA

Objective: Understand the value and limitation of capsular tension rings.
Main message: Surgical use of capsular tension rings with description of Cionni variation and capsular tension segment.
Conclusion: 1. Capsular tension rings with variations are valuable adjuncts to surgery; 2. Value long term not known; 3.In pseudoexfoliation there may be value short and long term.

D104 COMBINED CATARACT AND GLAUCOMA SURGERY WITH MMC
P. Palmberg, K. Ishida
Miami, FL, USA

Objective: To illustrate a surgical strategy for obtaining long-term pressure control in the target pressure range.
Technique: We will illustrate our technique for performing a 2-site PE c PC IOL and MMC filtering procedure that features a valve-like filtering incision and intraoperative adjustment of the scleral flap resistance. The technique begins with a temporal clear corneal phaco-emulsification. Pupils are stretched as needed, using 2 Kuglen hooks. The nucleus is hemi-dissected and chopped. An acrylic PC IOL is implanted. A 6 clock hour superior fornix-based conjunctival-Tenon's capsule flap is dissected, taking care to identify the temporal margin of the Tenon's insertion so that we can enter the sub-Tenon's space and shear Tenons and conjunctiva together at their insertions. This markedly reduces bleeding and leaves intact a belt of tissue for a water-tight closure. A 3 mm two-thirds thickness groove is made at 12 o'clock at the back of the limbal blue. MMC (0.4 mg/ml) is applied for 5 minutes with three 6x 4 mm very thin sponges, cut from the side of a Weckcel sponge. The sponges are removed and copious irrigation performed. A Crescent blade is used to tunnel 2 mm forward from the base of the groove, and the anterior chamber entered with a Keratome. A 0.75 mm Kelly Decemet's punch is used to perform a posterior lip sclerectomy, adjusted to produce a valve-like incision corresponding to an equilibrium pressure of 4-6 mm Hg. This is tested by instilling BSS through a paracentesis, watching the flow to equilibrium, and estimating the IOP by pressing on the cornea with a 30g cannula. Two or more 10-0 nylon sutures are then placed to adjust the IOP at equilibrium flow to 8-12 mm Hg. The conjunctiva is closed with a series of buried mattress sutures, taking care to build out tension along the limbus and to take vertical bites in the sclera that will not later claw through either sclera or conjunctiva.
Results: The mean IOP in 265 eyes operated upon with either an ECCE, 1-site or the current 2-site procedure was reduced from 23 to 11 mm Hg during up to 10 years of follow up. The mean of the HVF MD improved about 4 dB (from -13 to -9) after cataract removal and thereafter was stable throughout follow up. The PSD (5dB) was unchanged throughout. Very few cases of late hypotony were encountered.
Conclusions: The strategy of using a valve-like incision, intraoperative IOP adjustment, and MMC application to inhibit the formation of additional resistance, yielded long-term pressure control in the target range and minimized the risk of hypotony.

D105 GLAUCOMA DRAINAGE DEVICE AND CATARACT SURGERY
D.L. Budenz
Miami, FL, USA

Objectives: To describe the technique and outcome of combined cataract and glaucoma drainage device surgery.
Main message: Although combined cataract surgery and trabeculectomy has been the procedure of choice in patients who require both cataract and glaucoma surgery, there may be times when performing a glaucoma drainage implant at the time of cataract surgery is preferred. Examples include patients who have previously failed trabeculectomy, those in whom trabeculectomy is expected to have poor success rates (uveitis, ICE syndrome, etc.), and those in whom trabeculectomy may be contraindicated (chronic blepharitis).
Conclusion: In patients with indications for both cataract surgery and glaucoma implant surgery, both procedures can be done at the same time with good visual and IOP outcomes.

D106 MOLECULAR GENETICS OF PRIMARY CONGENITAL GLAUCOMA: THE INDIAN SCENARIO
S.C. Chakrabarti[1], K. Kaur[1], A.K. Mandal[1], R. Thomas[1], I. Kaur[1], S.E. Hasnain[1], K. Ray[2], P.P. Majumder[2], D. Balasubramanian[1]
[1]Hyderabad, India, [2]Kolkata, India

Objective: To understand the underlying molecular mechanisms in primary congenital glaucoma in the background of CYP1B1 mutations and their role in disease pathogenesis with special reference to the Indian subcontinent.
Main message: Primary congenital glaucoma (PCG) with a predominantly autosomal recessive mode of inheritance exhibits a high prevalence among the inbred populations (one in 1250 among the Slovakian gypsy and one in 2500 among Saudi Arabians). It affects around one in 3300 live births in the Indian state of Andhra Pradesh and consanguinity is one of the major risk factor towards disease predisposition. Three chromosomal loci have been mapped for PCG on 2p21 (GLC3A), 1p36 (GLC3B) and 14q24.3 (GLC3C), of which the human cytochrome p450 gene CYP1B1 on GLC3A has been characterized. The frequency and spectrum of CYP1B1 mutations vary widely across different ethnic groups and populations. In the Indian scenario, CYP1B1 accounts for 40% of all PCG cases with variable penetrance and the Arg368. It is the most common mutant allele. There is also an evidence of Myocilin (MYOC; another glaucoma causing gene, particularly in juvenile and adult-onset POAG) being implicated in PCG. Some of the CYP1B1 heterozygotes exhibit digenic inheritance in association with MYOC while there is also an evidence of homozygous MYOC mutant alleles manifesting PCG. Genotype-phenotype correlation indicates phenotypic heterogeneity for similar mutations. The severity of the phenotype is further attributed to the combination of mutant alleles in homozygous or compound heterozygous state and early surgical interventions in some of these cases have lead to a better prognosis. Haplotypes generated from five intragenic single nucleotide polymorphisms (SNPs) revealed mutation-specific signatures in CYP1B1 that are markedly different from other populations and could be of great potential in devising molecular diagnostics. Based on the haplotype background, it has been possible to understand the origin of CYP1B1 mutations from the ancestral great apes due to recombination events and their migration in populations worldwide. This has potential implications for devising molecular diagnostics and in understanding their role in the disease pathogenesis.
Conclusions: 1. CYP1B1 gene mutations accounts for varied proportion of PCG cases worldwide and for about 40% of cases in India; 2. The Arg368His is the most common mutant allele among Indian PCG cases; 3. A proportion of PCG cases exhibit digenic inheritance involving MYOC and CYP1B1 while some are homozygous for mutant MYOC allele; 4.The severity of phenotypes could be attributed to the combination of mutant alleles in the genotype; 5. Intragenic haplotypes indicate common founders for the origin of CYP1B1 mutations across populations that arose due to recombination events from the ancestral great apes; 6. Mutation-specific haplotypes could be used as potential tools for devising molecular diagnostics that can aid in population screening and early intervention.

D107 NEW DIRECTIONS FOR GLAUCOMA GENETIC RESEARCH
A. Viswanathan
London, United Kingdom

Objective: To describe the move towards genetic epidemiological approaches which are increasingly being used to complement classical Mendelian studies in glaucoma.
Main message: Classical Mendelian linkage methods are not sufficient to define the genetic basis of the common glaucomas. An approach based on genetic epidemiology will be necessary and will require large scale collaboration between molecular geneticists, clinicians and genetic epidemiologists. Such a network, EGS GlaucoGENE, has been formed in Europe.
Conclusions: 1. Genes found by classical linkage do not explain the bulk of glaucoma; 2. Genetic epidemiology offers the promise of finding the genes underlying the common glaucomas; 3. EGS GlaucoGENE has been set up to pursue this goal.

D108 PERSPECTIVES IN GLAUCOMA: FROM CELL BIOLOGY TO EPIDEMIOLOGY
P.R. Healey
Westmead, Australia

Objective: To explore the role of risk and outcome across the spectrum of the glaucoma process and from a cellular to population level.
Main message: Like many other pathological processes, the process of glaucoma can be defined by state, rate and risk. State tells us about the past and helps determine disability. Rate of change defines our current concept of glaucoma and predicts the future. But rate is the most difficult aspect of glaucoma to assess. Risk is the determinant of rate and is often used in its place prognostically. However the relationship between state and disability, as well as risk and rate are complex and vary depending on focus. This talk will explore they way these relationships change from a cellular to population-based focus and from early to advanced disease.
Conclusions: 1. Glaucoma is a process rather than a disease state; 2. The state or stage of the process is a determinant of disability; 3. Risk is often used as a surrogate for process rate to predict the future; 4. State, rate and risk all vary considerably across the spectrum of patients with glaucoma; 5. The relationship between state, risk and their determinants also varies considerably; 6. This has significant implications for glaucoma risk calculators as well as prediction of disease impact.

D109 WILL MY PATIENT DEVELOP GLAUCOMA? RISK ASSESSMENT IN OCULAR HYPERTENSION
A. Medeiros
La Jolla, CA, USA

Objective: To review the evidence concerning risk factors for progression from ocular hypertension to glaucoma and to present a simplified model for predicting the risk of glaucoma development for an ocular hypertensive patient based on published results from the Ocular Hypertension Treatment Study (OHTS). The use of this predictive model will be illustrated through clinical cases.
Main message: The decision to treat an ocular hypertensive patient should involve a

Saturday, July 9, 2005

global assessment of risk factors for development of glaucomatous damage. A simple scoring system can provide an easy way for clinicians to estimate the risk of glaucoma development for an individual patient, using just simple arithmetics that can be applied without a calculator or computer.
Conclusion: An OHTS-derived predictive model can be useful to assess the risk of glaucoma development in untreated ocular hypertensive patients. Incorporation of such a risk model into clinical practice could provide a better assessment of the global risk for disease development in a particular patient and help in clinical decision making regarding treatment.

D110 NEW FRONTIERS IN ANGLE CLOSURE GLAUCOMA RESEARCH
T. Aung
Singapore

Objective: To review recent developments in angle closure glaucoma (ACG) research. Main message: A new diagnostic classification of ACG has been adopted, which provides a more uniform definition of the disease. Recent epidemiological studies have provided new information about ACG prevalence, risk factors and mechanisms. Surgical and laser trials for ACG are being conducted. Recent advances in imaging, such as the anterior segment OCT, have led to more objective ways of defining the angle. Genetic studies are also being performed to determine the genetic basis of the condition.
Conclusions: The latest advances in PACG research will be summarized.

D111 NEW POSSIBLE MEDICAL THERAPY FOR GLAUCOMA
M. Honjo
Osaka, Japan

Objective: Elucidating the mechanisms that regulate aqueous humor outflow facility through the trabecular meshwork (TM) is fundamental to the investigation of glaucoma. Recently, numerous studies have centered on understanding how cells of the outflow pathway interact and thus influences the filtering capacity of the TM. In understanding TM cellular behavior, cellular contraction, relaxation and integrity of the cyteskeletal actin in TM cells have been thought to influence aqueous humor outflow. It has become apparent that the interplay between cell cytoskeleton and the surrounding extracellular matrix (ECM) provides valuable insight into the pathophysiological abnormalities that lead to impaired outflow and the consequent elevation in intraocular pressure (IOP). However, the cellular pathways that regulate these events in TM cells are not well understood.
Main message: In this study, we have attempted to elucidate a potential role for Rho/Rho kinase signaling in the modulation of aqueous humor outflow facility, which promote actomyosin-based cellular contraction. Administration of specific ROCK inhibitor Y-27632, MLCK inhibitor ML-9, and HA1077 resulted in a dose-dependent decrease in IOP in rabbit eye. An increase of the outflow facility was also observed. Immunoblot analysis revealed the presence of MLCK in human TM cells. Exposure to inhibitors dose-dependently inhibited MLC phosphorylation. The inhibitor caused retraction and dissociation of cells, disruption of actin bundles and impairment of focal adhesion formation in cultured TM cells. The IOP-lowering effects may be related to alterations of the signaling mechanisms that are integral to the regulation of TM function with respect to outflow facility.
Conclusion: Collectively, this study demonstrates the significance of Rho/Rho-kinase pathway-mediated MLC phosphorylation in modulation of aqueous outflow facility through TM. Modulating TM function in the regulation of the outflow pathway may open new approaches to develop new possible medical therapy for glaucomatous disease.

D112 THE FUTURE OF GLAUCOMA RESEARCH
R.N. Weinreb
La Jolla, CA, USA

1. Develop improved diagnostic measures to detect the onset of optic nerve damage. Develop novel therapeutic approaches. 2. Identify and characterize the genes, pathways, and regulatory signals responsible for glaucomatous optic nerve damage. 3. Determine the mechanisms of retinal ganglion cell loss and survival in glaucoma. 4. Elucidate the prevalence, natural history, and treatment outcomes for glaucoma. 5. Develop transgenic and other animal models of the principal clinical subtypes of glaucoma.

D113 FUTURE OF GLAUCOMA
R.A. Hitchings
London, United Kingdom

***Objective*: This presentation summarises the main points of the previous speaker and provides a view on the direction that clinical glaucoma is likely to take in the next five years.
***Main message*: Globalisation means better understanding of the problems in glaucomatous disease: prevalence, incidence, economics and treatment. As glaucoma is securely recognised as one of the major causes of visual loss world wide the need for better health care delivery as well as research into pathomechanisms is well established. These endeavours need to be allied to greater understanding of health economics and social awareness so that glaucoma prevention and care can achieve greater recognition in world health than it currently enjoys.
***Conclusions*: 1.** Some of the brightest minds in ophthalmology dedicate their lives to glaucoma research; 2. Increasing collaboration with laboratory scientists, economists, social scientists will broaden the appeal of the glaucoma carer to the wider community; 3. Globalisation gives greater appreciation of ethnic diversity in glaucoma; 4. Research in glaucoma needs to be shown to be of relevance both to the patient and to society to enable a sustaining level of investment to continue.

In days gone by . . . the words “I understand nothing” meant merely ignorance on the part of him who uttered them; yet, at present they bring great honour. One has only to declare with an open air and uppishly: “I do not understand religion; I understand nothing in Russia; I understand nothing in art” – and at once one is lifted to lofty heights.

And this is all the more advantageous if one, in fact, understands nothing.

F.M. Dostoyevsky

Thursday, July 7, 2005

2.15 – 3.15 pm.

GS01 GLAUCOMA: A SOCIETAL PERSPECTIVE
A.L. Coleman
Los Angeles, CA, USA

Purpose: To discuss the importance of a societal perspective in decision-making related to the diagnosis and treatment of glaucoma.
Methods: The presentation will consider rates of blindness in individuals with glaucoma, assessments of the economic effects of glaucoma, and the impact of glaucoma on quality of life.
Conclusion: When making decisions about resource allocation for screening and treatment of glaucoma, it is imperative to take a public-health perspective on undiagnosed disease and a societal perspective on the economic and human costs of the disease.

GS002 PATHOGENESIS AND PROGRESSION OF PRIMARY ANGLE CLOSURE GLAUCOMA
R. Sihota
New Delhi, India

Primary angle closure glaucoma is a complex disease in which anatomical factors and physiological factors both play an equally important part.
Anatomically a PACG eye has been known to be shorter, with a thicker lens and shallower anterior chamber. Physiologically it has been thought that a mid dilated position of the pupil during stress, in twilight etc allows the occurrence of a relative pupillary block and angle closure. However, the clinical manifestations of PACG are not uniform, and why the different subtypes of PACG occur is still not clear. Biometric studies have shown that eyes having acute attacks of PACG had the shallowest AC and the thickest lenses, chronic PACG eyes were similar, but less deviated from normal, and subacute PACG eyes were nearest in anatomical structure to control eyes. A study of the UBM parameters in the different subtypes showed that the iris thickness was least in acute PACG eyes, and the angle recess was narrowest.
We have shown that a Valsalva maneuver narrows the angle and raises IOP, and could be a further physiological mechanism by which angle closure glaucoma occurs and also progresses.

Friday, July 8, 2005

2.00 – 3.00 pm.

GS03 WOUND HEALING
P. Khaw
London, United Kingdom

Objective: To review reasons for healing modulation in most patients undergoing surgery and current and possible future anti-scarring therapies and techniques.
Main message: 1. Lower pressure targets are required after surgery to achieve minimal glaucoma progression; 2. Antiscarring therapies can help achieve these targets relatively safely; 3. Better treatments will be available in the future.
Conclusions: 1. Recent clinical trials provide strong evidence that pressures in the low teens are associated with minimal progression. In our recent More Flow study no patient who had pressures less than 14 mmHg on all visits experienced glaucomatous progression over a period up to eight years.The major determinant of the long term pressure after surgery is the scarring response of the eye; 2. Advances in antiscarring therapy have improved the success of surgery and improvements in surgical technique have reduced complications; 3. Further advances in therapies and techniques should enable lower long term pressures with minimal complications.

GS04
ANTERIOR SEGMENT CHANGES AFTER FILTERING SURGERY
N-L Wang
Beijing, China

Objective: To summarize the anterior segment changes after trabeculectomy .
Main message: The use of antimetabolites in trabeculectomy might lead to the development of thin and avascular blebs. Histological analysis of thin blebs excised demonstrated decreases in epithelial thickness and goblet cell density and exhibited decreases in localized stromal vascularity and increases in surrounding stromal vascularity.The aqueous humor can egress from the filtering bleb through the thin avascular bleb wall without a focal leak point and such transconjunctival aqueous egress (oozing) might predispose not only to apparent point leak, but also directly to bleb-related complications, including persistent hypotony or local infections even endophthalmitis. Otherwise, the thin-walled bleb maybe a passage for ophthalmic solution penetrate into eyes. The postoperative use of 5-FU after glaucoma filtration surgery leads to tears film abnormalities apparently. Eyes with glaucoma filtering bleb experience more paresthesia than eyes without filtering blebs. Following trabeculectomy at the superior temporal quadrant, downward extension of the lacrimal gland should be a possible source of a patient's complaint of epiphora. It is probable that the surgical trauma, in combination with the antimetabolic effect of the MMC, led to irreversible stem cell damage and ocular surface disease. Subconjunctival injections of 5-FU glaucoma filtering procedures may lead to limbal deficiency. Prolonged damage to the corneal epithelium following successful trabeculectomy is demonstrated by impaired epithelium barrier function and a high incidence of microcystic edema, corneal dellen and bubble. Early postoperative iridocorneal touch is unlikely to lead to corneal compromise in most eyes, but that corneolenticular touch can result in severe endothelail cell loss. Trabeculectomy alters corneal curvature and axial length, and in both the superior steepening and superior flattening groups there was an increase in vertical keratometry and a shift towards 'with-the-rule' astigmatism. The decrease in size of Schlemm's canal after successful filtration surgery could make glaucoma more difficult to control if the filter ultimately fails. Anterior chamber inflammation and breakdown of the blood-aqueous barrier ocured after trabeculectomy and the aqueous flare retured to baseline levels 4 weeks after surgery. After adjustment for age and diabetes, trabeculectomy increased the risk of cataract formation by 78%.
Conclusions: With the developing of social situation, life quality has been pursued more. Tunnel based inflow stratedies should be the trend of anti-glaucoma surgery in future.

Saturday, July 9, 2005

2.00 – 3.00 pm.

GS05 NORMAL-TENSION GLAUCOMA: AN ENIGMA TO ALL OF US
T. Yamamoto
Gifu-shi, Japan

Objective: Much attention is being paid recently to normal-tension glaucoma (NTG). This interest is driven by three main factors: a high prevalence rate, its usefulness as a natural model of glaucomatous optic neuropathy lacking evidence of high IOP, and the recent discovery that this type of neuropathy could be stabilized by treatment. The objective is to show our current understanding of this enigmatic condition.
Main message: NTG is the most prevalent subtype of glaucomas in Japanese aged 40 years or older, having a prevalence of 3.6%. The prevalence increases rapidly with age, reaching 7% in those aged 70 years or older. We still do not fully understand the pathogenesis of NTG or the best method for the management of the condition. However, many reports have concluded that ocular hypotensive therapy is the treatment of choice and that several IOP-independent factors are closely associated with NTG. The cause of the conflicting findings must be carefully considered in the near future.
Conclusions: NTG is the most prevalent subtype of glaucomas in some ethnic groups. IOP-independent, probably vascular, factors coexist with IOP-related ones in NTG.

GS06 PERIMETRY AFTER SURGERY IN LATE-STAGE GLAUCOMA.
J.F. Casiraghi, P. Lavena
Buenos Aires, Argentina

Objective: The purpose of this presentation is to review information about visual field evolution after trabeculectomy in advanced glaucoma patients.
Main message: Patients with late diagnosis of glaucoma, or whose structural and functional defect has progressed in spite of early diagnosis and treatment, may reach an advanced glaucoma stage. The IOP target in advanced-glaucoma patients should be lower than in early and moderate glaucoma. Advanced-glaucoma patients need combined medication or filtering surgery with or without antifibrotic agents to attain a low IOP: 12 mmHg or less, invariable during the course of the day. Advanced-glaucoma follow-up is more consistent with SAP than with ophthalmoscopic evaluation. Minor changes in optic nerve deterioration may cause a marked central vision loss. Progression occurs in a certain percentage of operated advanced glaucomas even with IOP controlled within normal values. Most of these patients are elderly persons with difficulties to instil ophthalmic drops. Compliance is a key factor for successful treatment; patients should be assisted to improve their skill to instil drops, and instructed on the need to strictly meet the treatment. Sometimes psychotherapy might be required. Subsequent monitoring of the surgery and antiglaucoma medication's hypotensive effect must include a daily ocular pressure curve, as in order to decrease defect progression risk, besides attaining the target IOP, the pressure should be controlled to prevent peaks during the day. Other factors should be considered in advanced glaucomas, besides IOP, that may cause structural or functional deterioration, among them thin corneas, nocturnal arterial hypertension (dippers), anemias and blood dyscrasias, sleep apnea, vasospasms (migraines, Raynaud, variant angina) compliance, cataracts, maculopathy.
Conclusions: In advanced glaucomas, SAP for perimetry controls is preferable to SWAP or FDT. Various algorithms have been developed in SAP to identify defect progression. In terminal visual fields with a central remnant, its stability or progression control should be made with 10º programs (macular) instead of 30º programs. In these patients the presence of technical artefacts such as poor cooperation, loss of fixation and fatigue are more frequent than in initial and moderate glaucomas, therefore increasing the long-term fluctuation and compounding the control of the lesion stability or progression. Patients with a central remnant may present the wipe-out phenomenon after trabeculectomy. Reducing IOP in advanced-glaucoma patients is a priority to decrease optic nerve and visual field deterioration. Trabeculectomy is the most effective, long-lasting and safest treatment to reduce intraocular pressure. Occasionally additional post-op medical treatment is required to further lower IOP and decrease defect progression risk. According to AGIS, intraocular pressure lowering ALT or trabeculectomy reduce the risk of established advanced glaucoma progression when intraocular pressure is consistently controlled below 18 mmHg. In terminal glaucomas, home accidents, tripping, falls, burns, as well as depression, are more frequent than in the general population. The quality of life is most affected when campimetric progression occurs in advanced glaucomas, rather than when progression occurs in early and moderate glaucomas.

COURSES

Thursday, July 7, 2005

2.15 – 3.15 pm.

C001 AN OVERVIEW ON NEW INSTRUMENTS AND TECHNOLOGY FOR IMAGING (INTRODUCTORY)

L.M. Zangwill (chair)[1], E.Z. Blumenthal[2], S. Miglior[3], D.S. Greenfield[4]
[1]San Diego, CA, USA, [2]Jerusalem, Israel, [3]Milan, Italy, [4]Miami, FL, USA

Objective: To review recent advances in imaging instruments for the diagnosis and management of glaucoma.
Introduction: Dr. Linda Zangwill.
HRT – recent advances: Dr. Stefano Miglior.
The most recent advances in the HRT II consist of utilizing discriminant functions and/or regression analyses to identify normal optic discs from abnormal and borderline ones with a high degree of discrimination. HRT II also provides several automated analysis of change over time based on trend analysis of the global disc or of sectors of the disc, and on the topographic change analysis which does not require the drawing of the contour line around the disc border. Moreover new software will be soon be available that includes a 'reference plane free' longitudinal evaluation.
GDx – recent advances: Dr. David Greenfield.
The GDx-VCC generates RNFL thickness assessments by neutralizing eye-specific corneal polarization axis and magnitude using the concept of the macula as an intraocular polarimeter. Compared with earlier commercial iterations, the GDx-VCC significantly improves the structure-function relationship in glaucoma, agreement with other imaging technologies, and discriminating power for glaucoma detection. Prospective studies have demonstrated that RNFL measurements using the GDx-VCC may predict progression in glaucoma suspects. Recent evidence suggests that atypical patterns of peripapillary birefringence have been observed in a subset of normal and glaucomatous eyes and commonly present as alternating peripapillary circumferential bands of low and high retardation around the optic nerve head. A modification of variable corneal compensation may reduce the prevalence of such artifact.
OCT – recent advances: Dr. Eytan Blumenthal.
Optical coherence tomography (OCT) was originally developed and marketed for retina diseases. However, with its ability to identify the retinal nerve fiber layer (RNFL) borders, and hence to provide accurate measurements of this layer, the value of OCT for glaucoma diagnosis and monitoring was soon realized. The recent addition of a normative database from which location dependent normative thickness values are derived, has further increased the value of this technology for the glaucoma patient. The relatively new Stratus OCT with its new normative database will be described and discussed.
Summary and conclusion: Dr. Linda Zangwill.

C002 ADVANCED OPTIC NERVE IMAGING (HRT, GDX, OCT) – PART 1

H.G. Lemij (chair)[1], R.D. Fechtner[2], F.A. Medeiros[3], C.F. Burgoyne[4], M.M. Iester[5], R. Burk[6], M. Fingeret[7]
[1]Rotterdam, Netherlands, [2]Newark, NJ, USA, [3]La Jolla, CA, USA, [4]New Orleans, LA, USA, [5]Genova, Italy, [6]Bielefeld, Germany, [7]Brooklyn, NY, USA

This course is intended to provide a basic description of the principles of scanning laser tomography (featured in the Heidelberg Retina Tomograph), scanning laser polarimetry (commercially available in the GDx) and optical coherence tomography (OCT), emphasizing their application on the assessment of structural damage in glaucoma. A systematic approach to the interpretation of printouts will be provided. Clinical indications and limitations for glaucoma diagnosis will be discussed.

C003 ADVANCES IN PSYCHOPHYSICAL TESTING FOR GLAUCOMA PATIENTS – PART 1

P.A. Sample (chair)[1], S.L. Graham[2], R. Harwerth[3]
[1]La Jolla, CA, USA, [2]Sydney, Australia, [3]Houston, TX, USA

Introduction to course: Dr. Pamela Sample.
Electrophysiology in Glaucoma: Dr. S.L. Graham.
This presentation will cover the theory and development of electrophysiological testing of visual function. A review of currently available methodology and results in patients with glaucoma will be given with emphasis on evidence-based findings.
Experimental Glaucoma for Evaluating Visual Function: Dr. R. Harwerth.
Animal models of ocular disorders provide unique information that can be applied to the diagnosis and treatment of patients. In most cases, however, the applicability of an experimental model must be validated by comparisons to affected functions in patients. This presentation will describe the primate model of experimental glaucoma for use in clinical studies of the structure-function relationship for standard automated perimetry. Studies of alternative methods of psychophysical testing for glaucomatous visual field defects will also be described.

C004 HOW TO DETECT PROGRESSION AND USE IT TO MANAGE GLAUCOMA – PART 1

D.F. Garway-Heath (chair)[1], B.C Chauhan[2], L.M. Zangwill[3], A. Heijl[4]
[1]London, United Kingdom, [2]Halifax, Canada, [3]La Jolla, CA, USA, [4]Malmö, Sweden

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.
Main message: 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, but the financial cost of the necessary examinations and inconvenience and psychological impact on the patient means that we have to concentrate our resources on those at highest risk of functional visual impairment. To identify those at highest risk, it is necessary to risk profile patients on the basis of known risk factors for glaucoma and glaucoma progression. Greater resources need to be concentrated on patients likely to progress at the highest rates. 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.
Conclusions: 1. Measuring rates of progression is optimal for following patient progress. 2. Risk profiling identifies patients at highest risk of functional visual impairment; 2. Resources should be concentrated on those at highest risk; 3. Both visual function and imaging measurements are needed to identify all progressing patients; 4. Greater availability of hardware and software support is needed to make use of current technology.

3.30 – 4.30 pm.

C005 THE ART OF WRITTEN AND ORAL PRESENTATIONS

D.S. Minckler (chair)[1], R. Hitchings[2]
[1]Los Angeles, CA, USA, [2]London, United Kingdom

Objective: To improve oral and written communications.
Message: Achieving success in publication, as in oral presentations, requires pre-planning and adherence to a logical sequence of thought. A thorough command of the subject in question and anticipating the interests, level of sophistication about the subject, and likely questions among members of the audience are particularly crucial to an effective oral presentation. Scientific writing and scientific presentations both profit from grammatically correct language, standard terminology and organization, and conciseness. The main goal of either is clear transmission of useful and valid information in palatable segments. Potential authors must review and adhere to specific format requirements of journals in which they wish to publish. Generally clinical vision journals require an abstract including from four to seven sections and text organization including an introduction, methods, results, a discussion, and references.
Conclusions: Authors or speakers describing clinical research data must acquire a basic understanding of study design and related biostatistical concepts to ensure that their analysis and conclusions about data are appropriate.
References:
1. Minckler D. Study design scheme, structured abstract sections and study design worksheets [Appendix to Instructions for authors]. Ophthalmology 1999; 106: 185-206. **2.** Style Manual Committee, Council of biology Editors: Scientific Style and Format: The CBC Manual for Authors, Editors, and Publishers, 6th ed. Chicago, Council of Biology Editors Inc., 1995.

C006 DESIGN, CONDUCT AND INTERPRETATION OF CLINICAL TRIALS: PEARLS AND PITFALLS

K. Singh (chair)[1], A. Coleman[2], H.A. Quigley[3], R.P.L. Wormald[4]
[1]Stanford, CA, USA, [2] Los Angeles, CA, USA, [3]Baltimore, MD, USA, [4]London, United Kingdom

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 so many of the decisions we make in 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.
Purpose: 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.

C007 VISUAL DISABILITY, QUALITY OF LIFE, AND OUTCOMES

A.C. Viswanathan (chair) [1], A. Azuara-Blanco[2], P.P. Lee[3], R.K. Parrish[4], G.L. Spaeth[5]
[1]London, United Kingdom, [2]Aberdeen, United Kingdom, [3]Durham NC, USA, [4]Miami, FL, USA, [5]Philadelphia, PA, USA

Objective: To provide an evidence-based overview of the impact of glaucoma on patients' ability to perform visual tasks, on their health-related quality of life, and on global and vision-specific functional outcomes.
Main message: Various different approaches have shown that there is a link between patients' measurable visual function and their own perceptions about their visual ability. This link is not confined to patients with end stage glaucoma. Global, ocular and visual morbidity may be caused not only by the disease process but also by the diagnosis and treatment of it. Glaucoma research and clinical practice need to concentrate more on measures and outcomes which are of relevance to the patient rather than merely of interest to the ophthalmologist.

C008 RISK FACTORS FOR THE DEVELOPMENT AND PROGRESSION OF GLAUCOMA

R. D. Fechtner (chair) [1], D.S. Friedman[2], P. Mitchell[3], T. Yamamoto[4]
[1]Newark, NJ, USA, [2]Baltimore, MD, USA, [3]Sydney, Australia, [4]Gifu-shi, Japan

Objective: To review risk data from recent glaucoma clinical trials and the models of global risk assessment that may help identify patients at highest risk of progression.
Main message: Cardiology has been modeling risk for 50 years. Studies have allowed the development of risk calculators to aid in treatment decisions. With the emerging evidence from large, prospective glaucoma trials, we are beginning to amass the data to allow us to be able to calculate the rates of visual loss from glaucoma. By applying global risk assessment, we can begin to develop models to identify those patients at highest risk of progression. We can then determine if these may benefit most from early or aggressive intervention. Major Clinical Trials Have Identified Risk Factors for Progression of Ocular Hypertension, Open-Angle Glaucoma, and Normal Tension Glaucoma: 1. Ocular Hypertension Treatment Study: Risk factors for developing glaucoma; 2. Early Manifest Glaucoma Study: Risk factors for progression in newly diagnosed glaucoma; 3. Collaborative Normal Tension Glaucoma Trial: Risk factors for progression in normal tension glaucoma
Risk factors: Studies have identified potential risk factors for progression. Some studies have conflicting findings: A. Race: Baltimore Eye Survey, Barbados Eye Study: 1. Blacks at greater risk, onset earlier, more severe at time of diagnosis; 2. up to 10% of blacks 70

Thursday, July 7, 2005

years old have glaucoma; B. Family History: Maternal side; C. Intraocular Pressure: Higher the IOP, greater the risk in most studies; D. Refractive Error: myopia
Blue Mountains Eye Study; E. Systemic health: vascular conditions such as diabetes, hypertension, conflicting data; F. Corneal thickness: OHTS, Independent risk factor after taking into account impact upon IOP
Conclusions: 1. The cardiovascular model is a useful schema for risk assessment; 2. Global risk assessment will help identify patients at high risk for progression; 3. Risk factors are emerging from large, prospective studies. 4. The risk factors may change along the glaucoma continuum

C009 PROOF OF GANGLION CELL DEATH PREVENTION
L. Levin (chair) [1], K.R.G. Martin[2], M. Schwartz[3]
[1]Madison, WI, USA, [2]Cambridge, United Kingdom, [3]Rehovot, Israel

Objective: Study novel methods for preventing retinal ganglion cells in optic nerve injury and experimental glaucoma
Main message: There are multiple mechanisms for preventing retinal ganglion cell death, including small molecules, peptides (growth factors), and beneficial autoimmunity.
Speakers: Michal Schwartz: The evidence for immune modulation as a treatment for preventing retinal ganglion cell death in optic nerve disease (including glaucoma); Keith Martin: The evidence for gene delivery approaches a sa treatment for preventing retinal ganglion cell death in optic nerve disease (including glaucoma); Leonard Levin: The evidence for pharmacological approaches as a treatment for preventing retinal ganglion cell death in optic nerve disease (including glaucoma).

C010 TELEGLAUCOMA
A. Tuulonen (chair)[1], G. Michelson[2]
[1]Oulu, Finland, [2]Erlangen, Germany

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. Ophthalmology, including glaucoma care, is an ideal application for telemedicine, since images and data from most peripheral units which we use for diagnosis and follow-up can be easily transferred from one site to another either on-line or off-line. In providing health services, telemedicine removes the limitation of distances both for the patient and the doctor. From the patient's perspective, distance health care ideally means receiving expert services, consultation, and a second opinion in his/ her neighbourhood. Barriers to the introduction of telemedicine are often non-technical, such as personal and organizational issues. Technology is effective only if the users adopt and apply it. The central and explicit goal of health system is to reduce costs by diminishing care that cannot be demonstrated to enhance the health of patients. Telemedicine offers nothing more than what can currently be done in the physician's office but represents a change in the process of medical care. The advantages of new technologies either improve current health care process, or while performing as well as older methods, cost less. Considerable research will be necessary before we have good and thorough understanding of the effects and effectiveness of telemedicine in glaucoma care.

C011 GENETIC TESTING AND COUNSELLING FOR THE GLAUCOMA PATIENT
L. Alward (chair) [1],J.E Craig[2], P.R. Healey[3]
[1]Iowa City, IA, USA, [2]Bedford Park, Australia [3]Sydney, Australia

This course will discuss the approach to the patient with heritable glaucoma. Obtaining the family history and pedigree drawing will be discussed. The known glaucoma genetic mutations will be reviewed. The promise of genetic testing for making a glaucoma diagnosis, determining disease course, screening and directing therapy will be reviewed.

C012 ADVANCED OPTIC NERVE IMAGING (HRT, GDX, OCT) – PART 2
H.G. Lemij (chair) [1], R.D. Fechtner[2], F.A. Medeiros[3], M.M. Iester[4], C.F. Burgoyne[5], R. Burk[6], M. Fingeret[7]
[1]Rotterdam, Netherlands, [2]Newark, NJ, USA, [3]La Jolla, CA, USA, [4]Genova, Italy, [5]New Orleans, LA, USA, [6]Bielefeld, Germany, [7]Brooklyn NY, USA

This course is intended to provide a guide on how to incorporate the results of scanning laser tomography (featured in the Heidelberg Retina Tomograph), scanning laser polarimetry (commercially available in the GDx) and optical coherence tomography (OCT), optical coherence tomography into clinical practice. A review of existing evidence for the utility of these instruments for glaucoma diagnosis and evaluation of progression will be provided. Emphasis will be given to the interpretation of printouts and its use for glaucoma evaluation, according to the principles of evidence-based medicine. Several case presentations will be used to illustrate the main concepts.

C013 ADVANCES IN PSYCHOPHYSICAL TESTING FOR GLAUCOMA PATIENTS – PART 2
P.A. Sample (chair) [1], J.G. Flanagan[2], R.S. Harwerth[3], C.A. Johnson[4]
[1]La Jolla, CA, USA, [2]Toronto, Canada, [3]Houston, TX, USA, [4]Portland, OR, USA

Introduction to course: Dr. Pamela Sample.
Testing Visual Function in Glaucoma Patients using Standard Automated Perimetry, Dr. J.G. Flanagan.
Standard automated perimetry (SAP) will be defined with particular reference to the levels of evidence available for commonly used instruments and testing strategies. Patient based variables such as the effect of media opacity, pupil size, learning and fatigue, will be considered, along with instrument variables, including background luminance, target size and threshold estimation paradigms. Evidence of the reproducibility and variability of SAP will be presented. The ability of SAP to stage the disease and evidence of the sensitivity and specificity for the detection of different disease stages will be discussed. Particular attention will be given to the measurement of disease progression and the implications of recent clinical trials.
Function-specific perimetry: ***Short-wavelength Automated Perimetry and Frequency Doubling Perimetry***, Dr. C.A. Johnson.
This presentation will provide an overview of SWAP, both full threshold and SITA-SWAP, and FDT, both with the original device and the new Matrix. It will include the underlying basis for each test, optimization of test procedures, a brief history of evidence-based findings in glaucoma, the advantages and disadvantages of SWAP and FDT, how to use each in evaluation of glaucoma, when to use each for evaluating glaucoma, and future directions.

C014 HOW TO DETECT PROGRESSION AND USE IT TO MANAGE GLAUCOMA – PART 2
D.F. Garway-Heath (chair)[1], B.C Chauhan[2], L.M. Zangwill[3], A. Heijl[4]
[1]London, United Kingdom, [2]Halifax, Canada, [3]La Jolla, CA, USA, [4]Malmö, Sweden

Please refer to C004

C015 ELECTROPHYSIOLOGY AND GLAUCOMA DIAGNOSIS
B.F. Fortune (chair)[1], V. Parisi[2], S.L. Graham[3]
[1]Portland, OR, USA, [2]Rome, Italy, [3]Sydney, NSW, Australia

Objective: To review the evidence from basic and clinical studies that either supports or refutes the possibility of successful glaucoma diagnosis by various electrophysiological techniques. Focus will be on the traditional full-field electroretinogram (ERG), the pattern electroretinogram (PERG), the multifocal electroretinogram (mfERG) and multifocal visual evoked potential (mfVEP).
Main message: The full-field ERG represents largely the function of photoreceptors and bipolar cells, and is only minimally affected in glaucoma. Full-field ERG changes are typically subtle and smaller that the range of variability among persons with normal vision. Therefore, with the exception of components such as the photopic negative response (PhNR) or the scotopic negative response (STR), the full-field ERG does not offer a measure of function that is useful for glaucoma diagnosis. In contrast, the PERG has been shown to be able to effectively distinguish between normal and glaucomatous eyes, as well as identify differences between normal eyes and those with ocular hypertension (OHT). Evidence will be presented to identify the retinal elements that generate the various ERG components, the PERG in particular. 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. Recent advances with the multifocal technique provided initial excitement for the potential diagnostic application to glaucoma. Studies on primate models of glaucoma have consistently shown that the multifocal ERG (mfERG) is affected by retinal ganglion cell damage. However, the majority of evidence from clinical studies of human glaucoma indicates that the mfERG will not be a particularly powerful diagnostic tool. This may reflect potentially interesting inter-species differences, although there is little direct evidence to support that conclusion at this time. In contrast, 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, such as in the central visual field, patients whom produce unreliable threshold visual field results, or during the very early stages of glaucoma/OHT.

C016 ASSESSMENT OF BLOOD FLOW IN GLAUCOMA
J. Flammer (chair) [1], M. Araie [2], G.A. Cioffi [3], A. Harris [4], S.I. Orgül [1]
[1]Basel, Switzerland, [2]Tokyo, Japan, [3]Portland, OR, USA, [4]Indianapolis, IN, USA

The role of blood flow evaluation for glaucoma patients will be discussed. We will have the following presentations: 1. Blood flow assessment in glaucoma patients, Dr. Selim Orgül; 2. How can blood flow be measured in glaucoma patients?, Dr. Alon Harris; 3. Influence of local applied medications on ocular blood flow, Dr. Makoto Araie; 4. Discussion and questions, Dr. Josef Flammer.

C017 THE ROLE OF OPTIC DISC PHOTOGRAPHS IN GLAUCOMA MANAGEMENT
B. Jonas[1](chair), P.J. Airaksinen[1], J. Caprioli[2], P. Mitchell[3]
[1]Mannheim, Germany, [2]Los Angeles, CA, USA, [3]Sydney, NSW, Australia

Objective: The objective of the course is to demonstrate the diagnostic value of ophthalmoscopic features of the optic nerve head for the diagnosis and follow-up of glaucomatous optic neuropathy.
Main Message: Morphologic optic disc parameters which can be assessed by ophthalmoscopy or on optic disc photographs are size and shape of the optic disc, size, shape and pallor of the neuroretinal rim, size of the optic cup in relation to the area of the disc, configuration and depth of the optic cup, ratios of cup-to-disc diameter and cup-to-disc area, position of the exit of the central retinal vessel trunk on the lamina cribrosa surface, presence and location of splinter-shaped hemorrhages, occurrence, size, configuration and location of parapapillary chorioretinal atrophy, diffuse and/or focal decrease of the diameter of the retinal arterioles, and visibility of the retinal nerve fiber layer. Most important variables for the early detection of glaucomatous optic nerve damage are neuroretinal rim shape (ISNT-rule), optic cup size in relation to optic disc size, diffusely or segmentally decreased visibility of the retinal nerve fiber layer, occurrence of localized retinal nerve fiber layer defects, and presence of disc hemorrhages.
Conclusions: These morphological parameters of the optic nerve head are helpful for the detection of glaucomatous optic neuropathy and for the detection of progression of glaucoma.

C018 VISUAL FIELDS IN ADVANCED GLAUCOMA
D.L. Budenz (chair)[1], R.L. Stamper[2], M. Fingeret[3]
[1]Miami, FL, USA, [2]San Francisco, CA, USA, [3]Brooklyn, NY, USA

Objectives: To provide practical information on diagnosing glaucoma worsening in patients with severe glaucoma.
Main message: Once the visual field is severely damaged, it can be difficult to diagnose glaucoma worsening with visual fields. Usual criteria for worsening, such as AGIS, CIGTS, EMTG, and Hodapp-Anderson-Parrish criteria, do not apply. Using a different programs of the Humphrey perimeter such as Size V test objects, 10 or 5 degree programs, or Goldmann perimetry, one can usually assess progression although there are no specific criteria to apply.
Conclusions: Visual fields can be used to follow advanced glaucoma but special programs must be employed and specific determination is more subjective than in early and moderate glaucoma.

COURSES

Friday, July 8, 2005

2.00 – 3.00 pm.

C019 GONIOSCOPY *VERSUS* UBM AND OCT FOR CHAMBER ANGLE EVALUATION – PART 1
C.E. Traverso (chair)[1], G. Marchini[2], P.J. Foster[3], W.L.M. Alward[4], J. Liebmann[5]
[1]Genova, Italy, [2]Verona, Italy, [3]London, UK, [4]Iowa City, IA, USA, [5]New York, NY, USA

The precise assessment of the anterior chamber angle is a prerequisite for appropriate diagnosis and consequential management of all forms of glaucoma. It is also essential for the assessment of the risk of angle occlusion in patients who may develop angle closure glaucoma. Examinations techniques vary according to the available technologies. The use of the slitlamp, goniolenses, ultrasound and OCT will be reviewed, with emphasis on practical clinical points. Even in the less developed settings, an evaluation of the angle should be obtained; this course will illustrate what is feasible with the available instruments.

C020 NEW TONOMETRY / CCT / CONTINUOUS IOP MEASUREMENT – PART 1
J.D. Brandt (chair) [1], M. Diestelhorst[2], Y. Kuwayama[3], Y. Lachkar[4], L.E. Pillunat[5], P. Shah[6]
[1]Sacramento, CA, USA, [2]Cologne, Germany, [3]Osaka, Japan, [4]Paris, France, [5]Dresden, Germany, [6]Birmingham, United Kingdom

We now recognize that tonometry as currently performed is much less accurate than previously appreciated. The OHTS demonstrated that central corneal thickness (CCT) is an important predictor of glaucoma risk, presumably through its effect on tonometry. This course will review what has been published to date regarding the impact of CCT on both clinical trials and on the individual patient, and how the clinician should interpret these results to deploy them in their practice. Various nomograms for adjusting IOP will be reviewed. The principles underlying new tonometers will be reviewed and their performance in the clinic discussed. New methodologies for continuous IOP measurement will be presented.

C021 GUIDELINES ON DIAGNOSIS AND TREATMENT OF ACG – PART 1
S. Friedman[1], T. Aung[2], P.J. Foster[3], D. S-C. Lam[4], P. Rojanapongpun[5], R. Thomas[6], N-L. Wang[7], J. Zhao[7]
[1]Baltimore, MD, USA, [2]Singapore, [3]Londen, United Kingdom, [4]Hong Kong, China, [5]Bangkok Thailand, [6]Hyderabad, India, [7]Beijing, China

This course will discuss in extenso the topics that have been presented in the morning session on angle closure glaucoma:
- How to diagnose ACG: gonioscopy, UBM, OCT, other
- Definitions of ACG, angle closure, occludable angle
- Screening for angle closure
- When should an iridectomy be done
- Is an iridectomy sufficient
- Medical treatment of ACG
- Treatment of the acute attack
- Other surgical options; cataract extraction or filtering surgery

After completion of the course the participant should be more confident in diagnosing and treating ACG.

C022 PRINCIPLES OF MEDICAL THERAPY IN GLAUCOMA PRACTICE – PART 1
G. Holló[1], C.B. Camras[2], C.A. Girkin[3], C. Migdal[4], S. Miglior[5], J. Thygesen[6]
[1]Budapest, Hungary, [2]Omaha, NE, USA, [3]Birmingham, AL, USA, [4]London, United Kingdom, [5]Monza, Italy, [6]Copenhagen, Denmark

Objective: This evidence based course covers the practical aspects of treatment selection, characteristics of the different drug classes, differences between drugs belonging to the same family and drug combination including combined topical medication.
Introduction: G. Holló.
Evidence-based treatment selection in glaucoma: C. Migdal.
Discussion
Characteristics of the different drug classes: A. Girkin.
Discussion
Structural analogues of PG F2alpha : ***an evidence-based clinical comparison***: C. Camras.
Discussion
Topical carbonic anhydrase inhibitors and alpha-agonists: ***an evidence-based clinical comparison***: J. Thygesen.
Discussion
Rational of drug combination, combined IOP lowering drugs: S. Miglior
Discussion
Summary, closure of the course: G. Holló

3.15 – 4.15 pm.

C023 GUIDELINES FOR THE DIAGNOSIS AND TREATMENT OF POAG: INDIVIDUALIZING GLAUCOMA MANAGEMENT
A. Tuulonen (chair)[1], A. Heijl[2], E.L. Greve[3]
[1]Oulu, Finland, [2]Malmö, Sweden, [3]Wijdemeren, Netherlands

Objective: The best evidence of effectiveness of health interventions is provided by high quality randomised controlled trials (RCTs). The goal of this course is to evaluate how the results of the recent RCTs can be applied in every-day clinical practice: What factors should be considered to individualize treatment protocols.
Main message: The goal of glaucoma treatment is to preserve the patient's Quality of Life. Treatment is indicated when it provides important benefits and outcomes that are important to the patients. Because the progression rates vary very much between patients, treatment and follow-up should be tailored to the needs of the individual patient. Since treatment may have favourable effects on one outcome and deleterious effects on another, evidence of treatment effectiveness does not automatically imply that treatment should be administered to every ocular hypertensive and glaucoma patient. It will also be discussed whether we should we consider costs in individualized glaucoma care.
Conclusions: The treatment plan and the goals for treatment should be worked out together with the patient. Before initiating the treatment, the following factors should be considered: 1. Patient´s age and life expectance; 2. Severity of glaucoma (both eyes); 3. Rate of progression: how rapidly the changes have progressed; 4. Intraocular pressure: at which level the damage has appeared and/or progressed; 5. Risk factors; 6. Patient´s other (ocular) diseases, medication and allergies; 7. Cost-effectiveness.

C024 EXPERIMENTAL MODELS OF GLAUCOMA
J.D. Lindsey (chair) [1], J.A. Cioffi[2], R.S. Harwerth[3]
[1]La Jolla, CA, USA , [2]Portland, OR, USA, [3]Houston, TX, USA

Investigation of the biological basis of glaucoma has been advanced by study of glaucoma models that allow experiments not possible in humans. In addition, these models facilitate testing of potential treatments to establish proof of principle for potential treatments prior to human testing. Because each of the models has strengths and limitations, the choice of model and the type of information that can be obtained are selected according to the problem to be addressed. This course will provide an overview of current experimental models of glaucoma with consideration of their relative advantages. Considered models will include cell cultures, organ cultures, and various animal models including rodents, other small animals, and primates. Questions answered include how each of these models may be used to advance basic understanding of glaucoma, and how rational model choice can facilitate the development of new glaucoma treatments. Finally, several recent advances obtained using various glaucoma models will be described to illustrate these principles.

C025 NORMAL PRESSURE GLAUCOMA
R. Hitchings (chair) [1], M. Aihara[2], Y. Kitazawa[3], T. Krupin[4]
[1]London, United Kingdom, [2]Tokyo, Japan, [3]Gifu, Japan, [4]Chicago, IL, USA

Natural history studies have provided clear outlines as to the risk run by patients diagnosed with normal pressure glaucoma. As a consequence it is possible to move towards a rational approach for treatment. The presenters in this course on normal pressure glaucoma will do just that. Krupin will discuss the demographics of patients in the USA 'low pressure glaucoma treatment study'. He will describe the study, its rationale and pointers towards appropriate treatment. Kitazawa will discuss risk factors for progression in patients with normal pressure glaucoma. Aihara will look at non pressure lowering treatments in the management of patients with normal pressure glaucoma in his talk entitled neuroprotective therapy for normal tension glaucoma.

C026 CONGENITAL AND INFANTILE GLAUCOMA
P. Khaw (chair)[1], M.S. Jafaar[2]
[1]London, United Kingdom, [2]Washington, DC, USA

Objective: Pediatric glaucoma is a rare and heterogeneous disease entity. Pearls in the diagnosis and management will be shared to help early diagnosis and treatment, and improve prognosis.
Main message: This course will overview important presenting signs and symptoms that help make early and accurate diagnosis of primary infantile glaucoma (Trabeculodysgenesis) and secondary pediatric glaucoma. Tonometry in the awake and sedated child will be covered in depth. Management, be it surgical or medical, will be then discussed with special emphasis on clinical pearls that would, hopefully, improve the outcome. Goniotomy and trabeculotomy ab-externo are the mainstay of pediatric glaucoma surgical intervention. Alternative procedures for refractory glaucoma will be also covered (Combined trabeculotomy-trabeculectomy, cyclo-ablation surgery, trabeculectomy with Mitomycin-C, stents...). The medical treatment of glaucoma will highlight critical features that are unique to children.
Conclusions: At the end of this course, participants will be able to: 1. Better diagnose and treat Infantile Glaucoma; 2. More accurately obtain Intra-ocular pressure measurements in infants and children; 3. Better perform goniotomy and trabeculotomy; 4. Appreciate alternate surgical procedures for refractory Infantile Glaucoma; 5. Recognize benefits and side-effects of medical treatment in Infantile Glaucoma.

C027 EXFOLIATION SYNDROME AND EXFOLIATIVE GLAUCOMA
R. Ritch (chair)[1], A.G.P. Konstas[2], U. Schlötzer-Schrehardt[3]
[1]New York, NY, USA, [2]Thessaloniki, Grees, [3]Erlangen, Germany

XFS in glaucoma cohorts is significantly higher than in age-matched non-glaucomatous populations. In persons with XFS, the risk of developing glaucoma is cumulative over time. Glaucoma in XFS has a more serious clinical course and worse prognosis than in primary open-angle glaucoma. There is a significantly higher frequency and severity of optic nerve damage at the time of diagnosis, worse visual field damage, poorer response to medications, more severe clinical course, and more frequent necessity for surgical intervention. Glaucomatous damage progresses more rapidly in patients with XFS and glaucoma than in patients with primary open-angle glaucoma. Persons with XFS are also predisposed to develop angle-closure glaucoma. Deposits of white material on the anterior lens surface are the most consistent and important diagnostic feature of XFS. The classic pattern consists of three distinct zones that become visible when the pupil is fully dilated. Whereas the classic picture of manifest XFS has been often described, the early stages of beginning exfoliation have not been well defined. Next to the lens, exfoliation material is most prominent at the pupillary border. Pigment loss from the iris sphincter region and its deposition on anterior chamber structures is a hallmark of XFS. Just as the iris scrapes exfoliation material from the lens surface, the material on the lens causes rupture of iris pigment epithelial cells at the ruff and sphincter region with concomitant dispersion of pigment into the anterior chamber. Loss of iris pigment and its deposition throughout the anterior segment are reflected in iris sphincter region transillumination, loss of the pupillary ruff, increased trabecular meshwork pigmentation, and pigment deposition on the iris surface. Associations with systemic disorders and blood flow abnormalities are being increasingly reported. These include elevated plasma homocysteine, transient ischemic attacks, stroke, aortic aneurysm, angina, myocardial dysfunction, myocardial infarction, systemic hypertension, Alzheimers disease and hearing loss. Reported blood flow abnormalities, both in the eye and in the brain, include reduction of flow in the middle cerebral artery, optic nerve, and peripapillary retina. Despite extensive research, the exact chemical composition of exfoliation material remains unknown. An overproduction and abnormal metabolism of glycosaminoglycans have been suggested as one of the key changes in XFS. The protein components of exfoliation material include both non-collagenous basement membrane components such as laminin, nidogen/entactin, and fibronectin and epitopes of the elastic fiber system such as alpha-elastin, tropoelastin, fibrillin, amyloid P, vitronectin, and probably the elastin-associated glycoprotein gp115/emilin. Regardless of etiology, typical exfo-

Friday, July 8, 2005

liation fibers have been demonstrated electron microscopically in close association with the pre-equatorial lens epithelium the non-pigmented ciliary epithelium the iris pigment epithelium the corneal endothelium, the trabecular endothelium and with almost all cell types of the iris stroma, such as fibrocytes, melanocytes, vascular endothelial cells, pericytes, and smooth muscle cells. The presence of XFS should alert the physician to the increased risks of intraocular surgery, most commonly zonular dehiscence, capsular rupture, and vitreous loss during cataract extraction. Predisposing factors include zonular fragility, poor pupillary dilation, phacodonesis, and posterior synechia formation. Heightened awareness of this condition and its associated clinical signs are important in the detection and management of glaucoma, and preoperative determination of those patients at increased risk for surgical complications.

PIGMENT DISPERSION SYNDROME AND PIGMENTARY GLAUCOMA

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. Myopia predisposes to the development of the phenotypic expression of PDS (80% are myopes, 20% are emmetropes, and hyperopia is rare). The mean degree of myopia in patients with pigmentary glaucoma is greater than that in patients with PDS and ocular hypertension and the age of onset of glaucoma is inversely proportional to the degree of myopia. The pathophysiologic mechanism consists of disruption of the iris pigment epithelium secondary to iridozonular friction, leading to dispersion of pigment particles throughout the anterior chamber and resulting in the classic clinical findings of corneal pigmentation (Krukenberg spindle); mid-peripheral, radial, slit-like iris transillumination defects, and dense pigmentation of the trabecular meshwork. Abnormally increased 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. This concavity increases during accommodation and lessens with the onset of presbyopia, while inhibition of blinking reverses the iris contour from concave to convex. Accommodation is a cause of myopia, which correlates strongly with intelligence, a characteristic of patients with PDS. The proposed role of accommodation in the development of the phenotypic manifestations of the disorder suggests alternative routes of therapy beyond lowering of intraocular pressure.

C028 GLAUCOMA AND UVEITIS

K Barton (chair)[1], S Gandolfi[2]
[1]London, United Kingdom, [2]Parma, Italy

Recalcitrant glaucoma is a common and potential blinding complication of chronic intraocular inflammation that responds poorly to medical therapy and is exacerbated by corticosteroid therapy of uveitis. The aim of this course is to review recent advances in the pathogenesis, medical and surgical management of uveitic glaucoma. In particular the instructors will discuss: 1.The relative indications for new glaucoma medications and their potential interactions with anti-inflammatory medication. 2.The role of alternative anti-inflammatory medications in patients with corticosteroid-sensitive glaucoma. 3.The relative indications for trabeculectomy, non-penetrating surgery and aqueous shunt devices in the management of uveitic glaucoma.

C029 GONIOSCOPY VERSUS UBM AND OCT FOR CHAMBER ANGLE EVALUATION – PART 2

C.E. Traverso (chair)[1], G. Marchini[2], P.J. Foster[3], W.L.M. Alward[4], J. Liebmann[5]
[1]Genova, Italy, [2]Verona, Italy, [3]London, UK, [4]Iowa City, IA, USA, [5]New York, NY, USA

Please refer to C019

C030 NEW TONOMETRY / CCT / CONTINUOUS IOP MEASUREMENT – PART 2

J.D. Brandt (chair) [1], M. Diestelhorst[2], Y. Kuwayama[3], Y. Lachkar[4], L.E. Pillunat[5], P. Shah[6]
[1]Sacramento, CA, USA, [2]Cologne, Germany, [3]Osaka, Japan, [4]Paris, France, [5]Dresden, Germany, [6]Birmingham, United Kingdom

Please refer to C020

C031 GUIDELINES ON DIAGNOSIS AND TREATMENT OF ACG – PART 2

S. Friedman[1], T. Aung[2], P.J. Foster[3], D. S-C. Lam[4], P. Rojanapongpun[5], R. Thomas[6], N-L. Wang[7], J. Zhao[7]
[1]Baltimore, MD, USA, [2]Singapore, [3]Londen, United Kingdom, [4]Hong Kong, China, [5]Bangkok Thailand, [6]Hyderabad, India, [7]Beijing, China

Please refer to C021

C032 PRINCIPLES OF MEDICAL THERAPY IN GLAUCOMA PRACTICE – PART 2

G. Holló[1], C.B. Camras[2], C.A. Girkin[3], C. Migdal[4], S. Miglior[5], J. Thygesen[6]
[1]Budapest, Hungary, [2]Omaha, NE, USA, [3]Birmingham, AL, USA, [4]London, United Kingdom, [5]Monza, Italy, [6]Copenhagen, Denmark

Please refer to C022

C033 GLAUCOMA IN SYSTEMIC DISEASES

J. Flammer (chair) [1], D. Gherghel[2], K. Kashiwagi[3], M. Pache[4]
[1]Basel, Switzerland, [2]Birmingham, United Kingdom, [3]Yamanashi, Japan, [4]Freiburg, Germany

In the first part, Mona Pache will present a review on systemic findings in patient with primary open angle glaucoma. Doina Ghergel will then discuss the relationship between peripheral circulation and ocular circulaton; the different provocation tests and the role of the autonomic nerve system. Josef Flammer will then discuss the behaviour of circulating lypmphocites in glaucoma patients.

C034 PRACTICAL DIGITAL SLIT LAMP PHOTOGRAPHY- A PRACTICAL GUIDE TO OPTIC DISC, ANGLE AND BLEB PHOTOGRAPHY

A.P. Wells (chair)[1], F.H. Grus[2], W. Birchall[1], B.C. Little[3]
[1]Wellington, New Zealand, [2]Mainz, Germany, [3]London, United Kingdom

Objective: To describe theory and methods of anterior segment and slit lamp image capture using digital media
Main message: By using a variety of available image capture devices and a basic understanding of the principles of photography, the capture of high quality images for research data collection, presentations, and publications is possible. This course will cover photography fundamentals, using consumer digital cameras with slit lamps, anterior segment and goniophotography, an introduction to digital video for ophthalmologists, and using image editing software to optimise images.
Conclusions: 1. Ophthalmic image capture on video or still camera digital media has advantages over analog methods; 2. Understanding photography topics such as illumination and metering increases the quality of captured still and video images; 3. Modern image handling software makes optimisation easy and powerful; 4. With the appropriate equipment and careful attention to a few basic techniques the quality of captured images can improve by a quantum leap. This is readily achievable and well within the budget and capabilities of most ophthalmologists.

C035 MEDICAL THERAPY PRINCIPLES

A. Alm (chair) [1], A. Azuara-Blanco [2], R.D. Fechtner [3], P. Kaufman [4], J. Thygesen [5]
[1]Uppsala, Sweden, [2]Aberdeen, United Kingdom, [3]Newark, NJ, USA, [4]Madison, WI, USA, [5]Copenhagen, Denmark

Eye pressure lowering drugs is the foundation of glaucoma treatment today. Still, medical treatment has not been unchallenged. We can leave the question if it has an effect on the rate of optic nerve damage or not behind us, but there are several questions and decisions facing us in our daily practice. This course is not about when to treat, but how to treat. During the last 10-15 years several new drugs have been introduced into clinical practice and with six pharmacological classes there are more than 100 possible combinations. Laser treatment and surgery are also developing. Has it made medical treatment decisions easier? Has treatment become more efficient? In this course we will focus on a number of topics that are important for better understanding of rational medical treatment.
Introduction: Dr. Albert Alm.
Medical treatment as first choice – pro and Con: Dr. John Thygesen.
How to initiate and evaluate glaucoma treatment: Dr. Robert D Fechtner.
Why are drugs not always effective?: Dr. Paul L Kaufman.
New drugs- who is the winner? Drug companies? Doctors? Patients?: Dr. Augusto Azuara-Blanco.

C036 NEUROPROTECTION AND APOPTOSIS OF RETINAL GANGLION CELLS RELATED TO GLAUCOMA

L. Levin (chair)[1], M.F. Cordeiro [2], N.N.Osborne [3], G. Tezel [4]
[1]Madison, USA, [2]London, United Kingdom, [3]Oxford, United Kingdom, [4]Louisville KY, USA

Objective: Study the nature of the retinal ganglion cell death seen in glaucoma.
Main message: There are multiple mechanisms which induce and then execute the death of retinal ganglion cells in glaucoma and other optic neuropathies.
Speakers: Neville Osborne: Assessment of the evidence that glutamate plays a part in the pathogenesis of glaucoma; Francesca Cordeiro: Monitoring and characterization of apoptosisin glaucoma and optic neuropathy; Gulgun Tezel: Oxidative mechanisms of fell death inglaucoma; Leonard Levin: Axonal signaling of retinal ganglion cell death.

Saturday, July 9, 2005

2.00 – 3.00 pm.

C037 OPTIMIZING TRABECULECTOMY OUTCOME: INTRAOPERATIVE TECHNIQUES – PART 1

F. Grehn (chair) [1], K. Barton [2], P.T. Khaw[2], J. Liebmann[3], P. Shah [4]
[1]Würzburg, Germany, [2]London, United Kingdom, [3]New York, NY, USA, [4]Birmingham, United Kingdom

Objective: Improvement of surgical technique to avoid immediate postoperative complications and long-term scar formation.
Main message: Preparation of the conjunctiva (fornix based versus limbus based), dissection of the scleral flap, and suture techniques are crucial to avoid postoperative hypotony, overfiltration, choroidal detachment and flat anterior chamber. Checking the outflow of the scleral flap by anterior chamber irrigation gives an estimate for postoperative IOP. Suture techniques can be adapted for to release or to adjust sutures later. Watertight closure of the conjunctiva is equally essential. Mitomycin C in various concentrations (0,1-0,5%) should be used in a large sponge or in sponge pieces distributed over a large area of the subconjunctival space.
Conclusions: 1. Fornix based conjunctival flap with a matress suture at the limbus is the preferred conjunctival technique to avoid leakage; 2. Adjustable or releasable sutures, as well as anterior chamber irrigation to test outflow are the means to avoid postoperative complications from overfiltration. 3. Mitomycin C should be adapted to the anticipated postoperative wound healing reaction and should be used over a large subconjunctival area.

C038 FILTERING SURGERY: PENETRATING / NON-PENETRATING / IMPLANTS – PART 1

T. Shaarawy (chair)[1], T. Dietlein[2], A. Mermoud[3], D.S. Minckler[4], P. Palmberg[5], C.E. Traverso[6], R.P. Wilson[7]
[1]Genève, Switzerland [2]Lausanne, Switzerland, [3]Cologne, Germany, [4]Los Angeles, CA, USA, [5]Miami, FL, USA, [6]Genova, Italy, [7]Philadelphia, PA, USA

In a glaucoma community that, rightfully, believe in evidence-based medicine, there is little room for every fine detail in glaucoma surgery to be scientifically validated. Never the less the minute modifications that result from decades of experience often make the difference between success and failure. This course, with its expert panel, shall address the fine surgical details in trabeculectomy, non-penetrating surgery, and tube implants, as practiced by the speakers who have refined their technique through years of practice.

C039 MANAGING CATARACT AND GLAUCOMA – PART 1

J.C. Caprioli (chair) [1], I.K. Ahmed[2], A.S. Crandall[3], D. S-C. Lam[4], K.F. Tomey[5], C.E.Traverso[6]
[1]Los Angeles, USA, [2]Toronto, Canada, [3]Salt Lake City, UT, USA, [4]Hong Kong, China, [5]Beirut, Lebanon, [6]Genova, Italy

Objective: To review and discuss the approaches to treating patients with cataract and coexisting glaucoma.
Main message: Patients with cataract and glaucoma may be treated with 1) cataract surgery first or alone, 2) filtering surgery first followed by cataract surgery later, or 3) with combined cataract and glaucoma surgery. Combined surgery should be performed through separate surgical sites or through the same site. The choice of the surgical approach depends on the severity and rate of progression of glaucoma, the patient's age, and other risk factors.
Conclusion: Patients with cataract and mild glaucoma may require only cataract surgery. Patients with advanced or advancing glaucoma are best served by filtering surgery performed alone. Patients with loose lenses, short eyes, and those with chronic angle closure are good candidates for combined surgery.

C040 LASER SURGERY OF THE IRIS AND THE ANGLE : LPI-ALT IRIDOPLASTY

Y. Lachkar (chair)[1], J. Katz[2], T. Realini[3], J. Thygesen[4]
[1]Paris, France, [2]Philadelphia, USA, [3]Morgantown, USA, [4]Copenhagen, Denmark

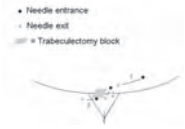
Indications, Procedure, lenses used, technique with laser parameters, complications and their treatments will be discussed.
LASER IRIDOTOMY
Indication: Clinically relevant pupillary block.
Preoperative preparation: Pilocarpine 2% or 4% single instillation and -Prevention of IOP spikes.
Procedure: A laser iridotomy contact lens is needed.
Iridotomy site: 1. superior quadrants of the iris covered by the upper lid (to prevent monocular diplopia). 2. avoid the 3 o'clock and 9 o'clock positions to lessen discomfort and reduce the risk of hitting the iris vessels. 3. avoid visible vessels. 4. as far peripherally as possible within the arcus senilis. 5. choose a thin looking area or an iris crypt. 6. electively superonasal to reduce the likelihood of a macular injury when using the Argon laser.
Laser parameters will be discussed. The purpose of the procedure is to obtain a full thickness hole of sufficient diameter to resolve the pupillary block. Perforation is assumed when pigment, mixed with aqueous, flows into the anterior chamber. The iris usually falls back and the peripheral anterior chamber deepens. Patency must be confirmed by direct visualization of the lens through the iridotomy. Transillumination through the pupil or the iridotomy is not a reliable indicator of success. The optimal size of the iridotomy is 100 to 500 µm.
Complications and Post-operative management will be discussed.
LASER TRABECULOPLASTY
Indications: POAG, exfoliative and pigmentary glaucoma when IOP is not satisfactorily controlled with medications, where the latter are contraindicated, or where compliance is a problem, such as in the elderly. Should initial medical therapy fail to control the patient's glaucoma, ALT could be offered for patients with heavily pigmented and for those patients who are infirm, elderly, or have a short life expectancy.
Preoperative preparation: prevention of IOP and topical anaesthesia.
Procedure: Argon laser (Green or Blue/Green) Diode laser Selective laser will be discussed. Complications and Post-operative management will be discussed.
LASER IRIDOPLASTY
Indication: 1. To widen the angle approach by shrinking the peripheral iris using a thermal effect. 2. Plateau iris syndrome. 3. In preparation for ALT when the angle approach is narrow, in order to better visualize the TM. 4. Angle closure in nanophthalmos.
Preoperative preparation: Contraindications will be discussed. Laser parameters will be discussed. Goal of treatment is contraction of the peripheral iris with flattening of the peripheral iris curvature. Ideal number of impacts: 20-50 applications over 360° leaving 2 beam diameters between each spot and avoiding visible radial vessels. Complications and follow up will be presented.

3.15 – 4.15 pm.

C042 THE USE OF RELEASABLE SUTURES IN GLAUCOMA SURGERY

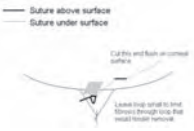
R.P. Wilson (chair)[1], J.S. Cohen[2]
[1]Philadelphia, PA, USA, [2]Cleveland, OH, USA

History: A. Shaffer and Hetherington[1] developed releasable suture for thermal sclerostomy (1971); B. Cohen/Osher[2,3] and Wilson[4,5] developed releasable sutures for trabeculectomy (early 1980's); C. Hoskins and Migliazzo[6] refined laser suture lysis and introduced the Hoskins lens (1984); D. Johnstone et al.[7] developed third type of releasable suture (1993); E. Modifications offered by Shin[8], and Hsu and Yarng[9].
Comparison: A. Cohen/Osher technique: 1. Easiest to do; 2. Causes no astigmatism; 3. Fibrosis through suture loop under conjunctiva limits length of time it can be left in place and then removed, 10-14 days in my experience. B. Wilson technique: 1. Relatively easy to place; 2. Causes astigmatism when in place; completely resolves when removed; 3. Epithelium grows over suture making exteriorized suture surprisingly comfortable if knot trimmed of rabbit ears; 4. Can be left in place for years and easily removed; C. Johnstone technique: 1. Most complex with longest learning curve; 2. Described only with limbal-based conjunctival flap; 3. Time and complexity prevent covering the Johnstone technique in this short talk; refer to reference for good illustrations on the technique; D. All techniques effective in markedly reducing complications of post-operative hypotony without compromising long-term IOP results: 1. Can be used with both limbus and fornix-based conjunctival flaps; 2. Should not be released or removed at target pressures or below unless enough time has passed for fibrosis to limit increased outflow; antifibrosis regimen needs to be included in this calculation.
Cohen/Osher technique:
A. Needle paths:

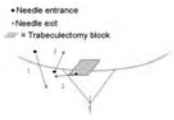


B. Suture diagram prior to tying:

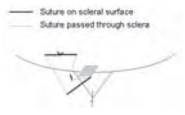
C: Suture diagram after tying:



D. To release, grab suture where exteriorized on surface and pull; E. If low IOP mandates leaving suture in place or if fibrosis through loop prevents its removal, pull suture out of distal corneal track, pull gently on suture and cut flush where suture emerges from sub-limbal track – will heal and be comfortable.
Wilson technique:
A. Needle Paths:



B. Suture diagram:



C. Tips: 1. Diverge suture tracks under limbus – when suture cut for removal, it is under tension and will retract; large knot (extra throws) and longer track on corneal surface leave enough end to grab for removal even after retraction; 2. To tie, put 4 throws in suture, pull ends toward feet then apart to set knot; adjust tension and add extra throws; 3. When removing: a. Cut suture on corneal surface at corner as far away from trabeculectomy as possible; b. Grab remaining suture and pull slowly but steadily down toward floor (easy does it – like having a six pound salmon on a two pound test line).

C043 FIBROSIS INHIBITION WITH FILTRATION SURGERY

P. Khaw (chair)[1], C. Baudouin[2], J. Crowston[3], B.E.Prum[4]
[1]London, United Kingdom, [2]Paris, France, [3]La Jolla, CA, USA, [4]Charlottesville, VI, USA

This course will enlarge upon the presentations and discussion during the morning session (Consensus). Risk factors for scarring should be known. The various methods for modula-

Saturday, July 9, 2005

tion of wound healing will be presented as well as the type of operation where they could be used. The right indications for fibrosis inhibition are essential as potential complications of its use may be serious. The signs of early scarring will be demonstrated. Surgical technique to prevent complications and if needed to deal with them will be shown. Post-operative care and bleb needling will be discussed.

C044 SAFE AND EFFECTIVE GLAUCOMA DRAINAGE DEVICE IMPLANTATION
D. Minckler[1] (chair), D.L. Budenz[2], R. Susanna[3], D.K.Heuer[4]
[1]Los Angeles, CA, USA, [2]Miami, FL, USA, [3]São Paulo, Brazil, [4]Milwaukee, WI, USA

Objective: Illustrate clinical aspects of drainage devices.
Message: Glaucoma drainage devices (aqueous shunts) utilizing a lumened tube to transport aqueous from the anterior chamber or vitreous cavity to the space around an equatorial explant are being utilized worldwide as useful alternatives to standard peri limbal filtering surgery or cyclodestructive procedures in complicated glaucomas. While the Molteno implant remains the 'gold standard', the Ahmed and the Baerveldt implants are also in wide usage. Features common to all these devices include explant construction from materials (polypropylene, polymethyl methacrylate, or silicone rubber) to which fibroblasts cannot tightly adhere. Differences between devices include variations in design, explant surface areas and shape, the presence or absence of valves, and details of surgical installation. All these devices have similar pathophysiology.
Conclusions: Randomized trials comparing techniques of installation, clinical outcomes, and complications between currently available drainage devices have been relatively few.

C045 PEDIATRIC GLAUCOMA SURGERY
N. Pfeiffer (chair) [1], F. Grehn[2], M.S. Jaafar[3], K.F. Tomey[4]
[1]Mainz, Germany, [2]Würzburg, Germany, [3]Washington, DC, USA, [4]Beirut, Lebanon

Congenital glaucoma is generally managed surgically. Both trabeculotomy and goniotomy are used to normalize IOP requiring a mean of 1.6 and 2.6 procedures, respectively. Trabeculotomy may be technically very demanding in very small eyes with a thin sclera. Goniotomy is often preferred and can be employed if the cornea is clear enough for proper visualization. A 120-degree incision of the non-functioning or anterior third of the trabecular meshwork is performed under direct microscope visualization. Several goniotomy lenses are available to facilitate this procedure. A combined Trabeculotomy-Trabeculectomy may be indicated in patients with post-uveitis glaucoma, borderline angle, Sturge-Weber syndrome, trabeculodysgenesis presenting late and in aphakia. Specific techniques will be presented. Diode Laser Endocyclophotocoagulation seems to deliver precise and controlled treatment and to be safe and effective in the treatment of aphakic and pseudophakic glaucoma. Cyclocryotherapy still has a place in the surgical armamentarium for the surgical treatment of refractory glaucoma. The numerous reported complications of cyclocryotherapy can be reduced if special precautions are taken. Course participants are encouraged to participate in discussions and case presentations.

C046 CYCLOPHOTOCOAGULATION – WHY, WHEN & HOW?
P. Bloom (chair) [1], D.K. Heuer[2], R. Susanna[3]
[1]London, United Kingdom, [2]Milwaukee, WI, USA, [3]São Paulo, Brazil

Summary: This instruction course will teach contemporary methods of cyclophotocoagulation. The aim of the course 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 (cryotherapy and YAG laser) 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.

C047 OPTIMIZING TRABECULECTOMY OUTCOME: POSTOPERATIVE MANAGEMENT – PART 2
F. Grehn (chair) [1], K. Barton [2], P.T. Khaw[2], J. Liebmann[3], P. Shah [4]
[1]Würzburg, Germany, [2]London, United Kingdom, [3]New York, NY, USA, [4]Birmingham, United Kingdom

Objective: Wound healing and scar formation are the main obstacles to favourable outcome in filtration surgery. Modulation of wound healing should be adjusted to developing bleb morphology.
Main message: Active bleb management is essential for over 50% of cases. Cork screw vessels need higher topical steroid dose. Early signs of scarring need repeated 5-FU injections in the neighbourhood of the bleb area. Encapsulation needs needling followed by 5-FU injections. Bleb revision and re-operations are less successful.
Conclusions: 1. Postoperative care must be adapted to morphological bleb development; 2. Steroids and 5-FU are the means to overcome excessive wound healing in the postoperative period; 3. Specific compounds are going to be developed to modulate the wound healing cascade more physiologically.

C048 FILTERING SURGERY: PENETRATING / NON-PENETRATING / IMPLANTS – PART 2
T. Shaarawy (chair)[1], T. Dietlein[2], A. Mermoud[3], D.S. Minckler[4], P. Palmberg[5], C.E. Traverso[6], R.P. Wilson[7],
[1]Genève, Switzerland [2]Lausanne, Switzerland, [3]Cologne, Germany, [4]Los Angeles, CA, USA, [5]Miami, FL, USA, [6]Genova, Italy, [7]Philadelphia, PA, USA

Please refer to C038

C049 MANAGING CATARACT AND GLAUCOMA – PART 2
J.C. Caprioli (chair) [1], I.K. Ahmed[2], A.S. Crandall[3], D. S-C. Lam[4], K.F. Tomey[5], C.E.Traverso[6]
[1]Los Angeles, USA, [2]Toronto, Canada, [3]Salt Lake City, UT, USA, [4]Hong Kong, China, [5]Beirut, Lebanon, [6]Genova, Italy

Please refer to C039

C050 SIZE MATTERS: INTRAOCULAR SURGERY IN HIGHLY MIOPIC OR NANOPHTHALMIC EYES
D.E. Grigera (chair)[1], R Gross[2], H. Tanihara[3]
[1]Buenos Aires, Argentina, [2]Houston, TX, USA, [3]Kyoto, Japan

Objective: To deliver information to the attendees that can be readily incorporated into clinical practice. Presentations will be validated with an evidence-based orientation. Pearls gleaned from clinical experience will be shared.
Main message: The contents will be divided into three topics: 1. Potential hazards in odd-sized eyes. An overview. This presentation will deal with the description of the potential problems, the recognition of the risk factors and the asking of the 'big questions' concerning these complications. High myopia: overfiltration, hypotonous maculopathy, suprachoroidal hemorrhage, others. Nanophthalmos: ciliochoroidal effusion, others; 2. Coping with the oversized. Answers on how to prevent and to manage complications in highly myopic eyes. Overfiltration, hypotonous maculopathy, suprachoroidal hemorrhage (How to operate to best avoid them, how to adjust filtration, role of suture lysis/releasable sutures in trabeculectomy, when and how to use antimetabolites, implant surgery in high myopia, non-penetrating, others, how to manage overfiltration and hypotonous maculopathy). Glaucoma surgery in myopic eyes with previous vitreoretinal operations; 3. Coping with the undersized. Answers on how to prevent and to manage complications in nanophthalmic eyes. Preoperative and postoperative ciliochoroidal effusion, malignant glaucoma, prophylactic posterior and anterior segment measures, how to filter minimizing risks, other surgical options for glaucoma in nanophthalmos and their role, (lens extraction, implants, cyclodestruction). A final discussion with participation of the audience will take place after the presentations.
Conclusions: Evidence-based and/or experience-based answers will be delivered for the following questions: 1. Which are the indications for cataract/traby/combined surgery in glaucomatous nanophthalmic eyes? 2. How to evaluate the risk of hypotonous maculopathy/suprachoroidal hemorrhage in highly myopic eyes? 3. How to prevent and to manage overfiltration/hypotonous maculopathy in highly myopic eyes? 4. How to perform a trabeculectomy/lens extraction/combined surgery in a nanophthalmic eye? 5. How to best manage a ciliochoroidal effusion? 6. How to best manage hypotonous maculopathy? 7. Which is the role for other techniques in odd-sized eyes (implants, non-penetrating etc)?

C051 PHACOEMULSIFICATION IN COMPLICATED GLAUCOMA CASES
J. Ge
Guangzhou, P.R. China

Objectives: To review and demonstrate the surgical techniques using phaco in the management of complicated glaucoma, such as uveitic and malignant glaucoma.
Main message: Phaco surgery is one of options in the management of complicated glaucoma, particularly in malignant and uveitic glaucoma, however, challenges and difficulties coexist. By using videos, photos and special case discussion, we will overview the technique and management of intra-operative complications, also point out the advantages of phaco surgery in this management.
Conclusions: phacoemulsification is effective and less invasive surgical management in complicated glaucoma.

Non penetrating trabecular surgery C-techniques and long term outcomes
N. Wang

Objectives: To review and demonstrate the surgical techniques of non-penetrating trabecular surgery (NPTS) in the management of medically uncontrolled primary open angle glaucoma (POAG).
Main messages: There are controversies on NPTS in the management of medically uncontrolled POAG. We will demonstrate this technique and postoperative management; particular attention will be on how to increase the success rate. The long-term outcomes and related factors will be discussed.
Conclusions: NPTS is an effective surgery but requires sophisticated technique and careful follow-up.

Surgical management of complicated neovascular glaucoma
J. Zhao

Objectives: To discuss the management of complicated neovascular glaucoma (CNG) that involving phacoemulsification, drainage implant, pars plana vitrectomy.
Main messages: There are a number of complications could happen in CNG cases in which have to involve multiple surgeries. By presenting one typical case, we will discuss the indications, techniques and complications in this surgical management.
Conclusions: Comprehensive surgical management is required in CNG.

Clinical trials in trabeculectomy, phacoemulsification and combined surgery in the management of primary angle closure glaucoma (PACG)
Xiulan Zhang

Objectives: To review and discuss the indication, techniques and complications on performing phacoemulsification in the PACG cases.
Main messages: Phaco has been suggested to be effective in the management of PACG and co-existing cataract. In this course, we will review the current available evidences and share our experience in this technique, also point out the key elements on performing this surgery and potential complications in PACG cases.
Conclusions: Phacoemulsification can achieve better visual outcome in management of PACG.

Surgical management of complicated congenital glaucoma
M. He

Objectives: To discuss the techniques and the management of complications in congenital glaucoma.
Main messages: Goniotomy, trabeculotomy and combined trabeculotomy-trabeculectomy were commonly used in the management of congenital glaucoma. However, the success rates are various and depend on a number of factors. In this course, we will demonstrate and discuss the techniques and complications of this treatment procedure, particularly point out the factors determining the success rates.

Saturday, July 9, 2005

Conclusions: Outcomes of surgical treatment in congenital glaucoma are various and depends on the careful patients¡¯ selection, techniques and postoperative follow-ups.

Drainage implants in refractory glaucoma
X. Sun

Objectives: To review and discuss the indication, techniques, complications and outcomes on performing drainage implants in refractory glaucoma.

Main messages: Management of refractory glaucoma is difficult when routine treatments are no longer effective in controlling the intraocular pressure. In this course, we will review the current commonly used drainage implants in clinical practice, share our experience in the indication, surgical techniques, postoperative management. We will also review the factors associated with outcomes and emphasize how to improve the success rate.
Conclusions: Drainage implant is effective in controlling intraocular pressure when the complications are able to managed properly.

POSTER ABSTRACTS

1. GENERAL ASPECTS

P001 PREVALENCE OF GLAUCOMA IN URBAN ADULT CHINESE: A POPULATION BASED SURVEY IN LIWAN DISTRICT, GUANGZHOU

M. He[1], P.J. Foster[2], W. Huang[1], P.T. Khaw[2]
[1]Zhongshan Ophthalmic Center, Guangzhou, China, [2]University College London, London, United Kingdom

Introduction: Data on prevalence of glaucoma in mainland China are scarce.
Aim of the study: To assess the prevalence and clinical characteristics of glaucoma in adult Chinese.
Methods: A total of 2313 subjects aged 50 years and over were identified from Household Residence Registry and door-to-door enumeration using clustered random sampling procedure. Glaucoma was diagnosed in people with 97.5th percentile of vertical cup disc ratio (VCDR) or asymmetry with a reproducible visual field defect, or on the basis of 99.5th percentile VCDR or asymmetry alone if field defect was not available. If both optic disc and visual field assessment were not possible, the diagnosis was based on blind vision with 99.5th percentile intraocular pressure or previous glaucoma filtering surgery and reliable medical records. The classification of the angle was based on gonioscopy.
Results: In a total of 1504 subjects (75.3%) examined, crude prevalence of all glaucoma was 3.8% (95% confidence interval [CI]=2.8%, 4.8%). Primary open-angle glaucoma (POAG) was found in 2.1% (95%CI: 1.4%, 2.8%), primary angle-closure glaucoma (PACG) in 1.5% (95%CI: 0.8%, 2.1%). The prevalence of all glaucoma was significantly higher in older and male cohort.
Conclusions: Prevalence of POAG was found to be much higher than the previous data in mainland China but was similar to that of Chinese Singaporean.
References:
1. Hu Z, Zhao ZL, Dong FT. [An epidemiological investigation of glaucoma in Beijing and Shunyi county]. [Chinese]. Chung-Hua Yen Ko Tsa Chih [Chinese Journal of Ophthalmology] 1989; 25:115-8. **2.** Foster PJ, Baasanhu J, Alsbirk PH, Munkhbayar D, Uranchimeg D, Johnson GJ. Glaucoma in Mongolia- A population-based survey in Hövsgöl Province, Northern Mongolia. Arch.Ophthalmol. 1996;114:1235-41. **3.** Foster PJ, Johnson GJ. Glaucoma in China: how big is the problem? Br J Ophthalmol 2001;85:1277-82. **4.** Foster PJ, Oen FT, Machin DS, Ng TP, Devereux JG, Johnson GJ *et al.* The prevalence of glaucoma in Chinese residents of Singapore. A cross-sectional population survey in Tanjong Pagar district. Arch Ophthalmol 2000;118:1105-11.

P002 CENTRAL CORNEAL THICKNESS IN AN OLDER POPULATION: THE BLUE MOUNTAINS EYE STUDY

P.R. Healey, P. Mitchell, E. Rochtchina, A.J. Lee, E.M. Chia, J.J. Wang
Centre for Vision Research, Westmead, Australia

Purpose: The accuracy of Goldmann applanation tonometry can vary if central corneal thickness (CCT) varies from the 500 microns assumed in the original formula[1]. A number of studies have reported increased CCT in ocular hypertension and decreased CCT in low tension glaucoma[2]. However reports from the relatively few population-based studies have been conflicting[3,4,5]. The aim of this study was to describe the distribution and associations of CCT in an older, largely Caucasian, population in Australia.
Methods: The Blue Mountains Eye Study examined 3654 participants aged 49+ years during 1992-4 (baseline), 2335 (75% of 3111 survivors) at 5-years (1997-9) and 1935 (75.0% of 2581 survivors) at 10-year (2002-4) exams. CCT measurements were performed in 1343 subjects at the 10-year exam. Subjects with and without CCT measurements did not differ significantly by age or gender. Multiple ultrasonic CCT measurements were made and averaged for each eye.
Results: CCT was normally distributed with a mean of 540 microns (SD±34) for right eyes and 539 microns (SD ±34) for left eyes (p=0.0003). It ranged from 418 to 661 microns. Mean CCT decreased with age, from 542 microns for ages 60-69, 541 microns for ages 70-79, 537 microns for ages 80-89 to 521 microns for 90+ years. These means were only minimally affected by adjustment for gender and IOP. Men had slightly thicker mean CCT than women (538 *vs* 534, p=0.05). Increased CCT was associated with increased IOP; CCT increased from 527 microns for IOP<10 mmHg to 550 microns for IOP >25 mmHg. Eyes with ocular hypertension at baseline had slightly thicker corneas (mean age-IOP adjusted CCT 547 microns) and eyes with open-angle glaucoma had slightly thinner corneas (mean age-IOP adjusted CCT 523 microns).
Conclusions: Corneal thickness is normally distributed and decreases with age. Mean corneal thickness was increased among subjects with ocular hypertension and reduced among subjects with open-angle glaucoma.
References:
1. Goldmann H, Schmidt T. Über Applanationstonometrie. Ophthalmologica 1957;134:221– 42. **2.** Singh RP, Goldberg I, Graham SL, *et al.* Central corneal thickness, tonometry, and ocular dimensions in glaucoma and ocular hypertension. J Glaucoma 2001;10:206-10. **3.** Iwase A, Suzuki Y, Araie M, *et al.* The prevalence of primary open-angle glaucoma in Japanese: the Tajimi Study. Ophthalmology 2004;111:1641-8. **4.** Foster PJ, Machin D, Wong TY, *et al.* Determinants of intraocular pressure and its association with glaucomatous optic neuropathy in Chinese Singaporeans: the Tanjong Pagar Study. Invest Ophthalmol Vis Sci 2003;44:3885-91. **5.** Wolfs RC, Klaver CC, Vingerling JR, *et al.* Distribution of central corneal thickness and its association with intraocular pressure: The Rotterdam Study. Am J Ophthalmol 1997;123:767-72.

P003 GONIOSCOPIC CHARACTERISTICS OF AN ADULT POPULATION FROM A POPULATION BASED STUDY

R. George[1], V. Lingam[1], P.G. Paul[1], H. Arvind[1], M. Baskaran[1], P. Raju[1], S.V. Ramesh[1], C. McCarty[2]
[1]Sankara Nethralaya, Chennai, India, [2]Marshfield Medical Research Fo, Wisconscin, WI, United States of America

Purpose: To study the gonioscopic characteristics among participants in a population based study.
Design: Cross sectional study
Participants: 3880 eyes (3880 participants)
Methods: 3880 (98.87%) right eyes of 3924 participants in the Chennai Glaucoma study[1] aged 40 years and above from rural Tamil Nadu (India) were included. The International Society of Geographic and Epidemiologic Ophthalmology (ISGEO) definitions were used for the study[2]. All subjects underwent vision and refraction, Goldman applanation tonometry, four mirror indentation gonioscopy[3], sterebiomicroscopic disc examination, optic disc photography, ultrasonic pachymetry and frequency doubling perimetry. A primary angle closure suspect (PACS) was defined as an angle where less than 6 clock hours of the filtering trabecular meshwork could be visualized in a phakic eye[4].
Main outcome measure: Gonioscopic pathology.
Results: 1739 males and 2141 females underwent gonioscopy in the right eye. The mean age was 53.68 (SD: ±10.65) years. PACS was seen in 302 eyes (7.7%), (including primary angle closure in 28 eyes (0.8%) and primary angle closure glaucoma in 34 eyes(0.9%)). Peripheral anterior synechiae secondary to a narrow angle was seen in 22 /302 eyes (7.28%). PAS due to other causes were seen in 163/3578 eyes (4.55%). The commonest cause of PAS was following cataract surgery. Angle recession was seen in 7 eyes (1.80%). Neovascularisation of the angle was seen in one eye.
Conclusions: Clinically significant angle abnormalities were seen on gonioscopy in 573 (14.77%) of this population.
References:
1. Hemamalini A, P G Paul, P Raju, Baskaran M, George R, Balu S, Sripriya S, Ve Ramesh S, Mukesh B, Vijaya L, Kumaramanickavel G, McCarty C. Methods and Design of the Chennai Glaucoma Study. Ophthalmic Epidemiology 2003;Vol 10:337-348. **2.** Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys. Br J Ophthalmol 2002;86:238-242. **3.** Shaffer RN. Symposium:primary glaucomas III. Gonioscopy. Ophthalmoscopy and perimetry. Trans Am Acad Ophthalmol Otol. 1960;62:112. **4.** Foster PJ, Aung T, Nolan WP, *et al.* Defining 'occludable' angles in population surveys: drainage angle width, peripheral anterior synechiae, and glaucomatous optic neuropathy in east Asian people. Br J Ophthalmol 2004;88:486-490.

P004 INTRAOCULAR PRESSURE AND ITS DETERMINANTS FROM A POPULATION BASED STUDY

L. Vijaya[1], R. George[1], M. Baskaran[1], H. Arvind[1], P.G. Paul[1], S.V. Ramesh[1], P. Raju[1], C. McCarty[2]
[1]Sankara Nethralaya, Chennai, India, [2]Marshfield Medical Research Fo, Wisconscin, WI, United States of America

Purpose: To study the distribution and determinants of intraocular pressure among participants in a population based study.
Design: Cross sectional study
Participants: 3278 eyes (3278 participants)
Methods: 3278 right eyes of bilaterally phakic participants in the Chennai Glaucoma Study[1] aged 40 years and above from rural Tamil Nadu (India) with no evidence of glaucoma, filtering surgery or prior anti - glaucoma medication use were included. Glaucoma was diagnosed using the International Society of Geographic and Epidemiologic Ophthalmology (ISGEO) definitions[2]. All subjects underwent vision and refraction, Goldman applanation tonometry, gonioscopy, stereobiomicroscopic disc examination, optic disc photography, ultrasonic pachymetry and frequency doubling perimetry.
Main outcome measure: Intraocular pressure.
Results: There were 1501 males and 1777 females. The distribution showed a skew to the right. The mean intraocular pressure was 14.20 (SD: 6.42) mm Hg (Range: 5 -33 mm Hg). Males have significantly (p<0.0001) lower intraocular pressure (13.96(SD:3.56) mm Hg) as compared to females (14.40(SD :3.32) mm Hg). Intraocular pressure was positively correlated with central corneal thickness (p< 0.0001). No significant correlation was seen with age. Intraocular pressure greater than 21 mm Hg was seen in 64 (1.9%) of persons. Pseudoexfoliation (p=0.002), diabetes (p=0.006) and systemic hypertension (p=0.002) were significantly associated with intraocular pressure greater than 21 mm Hg[3]. Mean CCT was significantly (p=0.009) higher among ocular hypertensives. There was no gender difference.
Conclusions: The intraocular pressure distribution in this rural population was similar to that reported from other population based studies[4,5]. Females had higher mean intraocular pressure. Ocular hypertension was significantly associated with pseudoexfoliation, diabetes, hypertension and central corneal thickness..
References:
1. Hemamalini A, P G Paul, P Raju, Baskaran M, George R, Balu S, Sripriya S, Ve Ramesh S, Mukesh B, Vijaya L, Kumaramanickavel G, McCarty C. Methods and Design of the Chennai Glaucoma Study. Ophthalmic Epidemiology 2003;Vol 10:337-348. **2.** Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys. Br J Ophthalmol 2002;86:238-242. **3.** Pseudoexfoliation in South India. Arvind H, Raju P, Paul PG, Baskaran M, Ve Ramesh S, George R, McCarty C, Vijaya L. Br J Ophthalmol. 2003 Nov; 87(11):1321-3. **4.** Foster PJ, Baasanhu J, Alsbirk PH, Munkhbayar D, Uranchimeg D, Johnson GJ.Central corneal thickness and intraocular pressure in a Mongolian population. Ophthalmology. 1998 Jun;105(6):969-73. **5.** Bonomi L, Marchini G, Marraffa M, Bernardi P, De Franco I, Perfetti S, Varotto A, Tenna V. Prevalence of glaucoma and intraocular pressure distribution in a defined population. The Egna-Neumarkt Study. Ophthalmology. 1998 Feb;105(2):209-15.

P005 GLAUCOMA PRESENTATION IN A TERTIARY HOSPITAL IN MALAYSIA-PRELIMINARY RESULTS

R.K. Khanna[1], G.R. Hay-Smith[2], I. Murdoch[3]
[1]University Science Malaysia, Kubang Kerian, Malaysia, [2]Institute of Ophthalmology, London, United Kingdom, [3]Moorfields Eye Hospital, London, United Kingdom

Introduction: Glaucoma is the most common form of irreversible blindness world-wide[1,2]. Patients with advanced glaucoma are at substantial risk of blindness before they seek medical attention for their eyes[3,4,5]. Various population-based studies have highlighted glaucoma prevalence and the small proportion of diagnosed cases receiving any form of therapy. A next logical step may emphasise public awareness and initiatives to improve the proportion in those receiving therapy.
Purpose: Purpose of this study was to describe demographic, socio-economic and clinical features of glaucoma patients presenting themselves to a tertiary hospital in Malaysia.
This prospective observational study included 58 consecutive patients presenting at Eye Clinic, Hospital University Science Malaysia with diagnosis of glaucoma.
Methods: Clinical and demographic features from clinical notes and responses from a structured questionnaire after interview with patients were recorded.
Main outcome measures: Main outcome measures included vision, IOP, type of glaucoma, eye symptoms, treatment modality, difficulty with daily tasks, travel time, occupation, education level and family history.
Results: Results showed 12 new and 46 old cases (17 had never attended this clinic before) and no sex predilection in those accessing therapy. Mean age was 64 years (median 67 years, range 24-85) in 40 Malay and 18 Chinese patients. Family history was not a notable trigger to presentation. Diagnoses were 40 OAG, 8 PACG and 10 others (*e.g.* steroid-induced, ocular hypertension). 27/58 patients had advanced disease in one or both eyes. 44/58 patients had IOPs less than 22mmHg in both eyes at presentation. All but one patient had received therapy, 15 had had surgery (only 3 with no more medication), 41 had just received medication. All lived within 2.5 hours travel time to the clinic (median 30 minutes) and occupational status reported a disproportionate number in skilled or semi-skilled occupations (18/27) compared to the country as a whole. Fifty patients had decreased vision and a further 4 other ocular symptoms. 37 (64%) were visually impaired or blind by WHO criteria in one (33), or both (7) eyes. Almost two thirds of patients reported difficulties with daily tasks including reading (11), walking outside (8), driving (4), moving in home (3), walking at night (3), close work (3) and other difficulties (4).
Conclusion: This small pilot study shows a significant visual handicap in those attending with

glaucoma in this Malaysian Eye Unit. Those presenting and receiving therapy are from a disproportionately higher socio-economic group with more education. There is a large preponderance of normal IOPs at presentation. The very small proportion of successful operations on no topical therapy suggests more investigation of surgical success is required. The above findings show a scope for improvement in therapy and initiatives in detecting the disease at earlier stage. One approach may be to highlight the familial nature of the disease and encourage attendance to family clinics.

References:

1. Quigley HA. Number of people with glaucoma worldwide. Br.J Ophthalmol. 1996;80:389-393. **2.** Coleman AL. Glaucoma. Lancet. 1999;354:1803-1810. **3.**Grant WM, Burke JF. Why do some people go blind from glaucoma? Ophthalmology. 1982;89:991-998. **4.** Fraser S *et al*. Risk factors for late presentation in chronic glaucoma. Invest Ophthalmol Vis Sci. 1999;40:2251-2257. **5.** Le A *et al*. Risk factors associated with the incidence of open-angle glaucoma: the visual impairment project. Invest Ophthalmol Vis Sci. 2003;44:3783-3789.

P006 5-YEAR INCIDENT EPISODES OF OPTIC DISC HAEMORRHAGE IN AN OLDER POPULATION: THE BLUE MOUNTAINS EYE STUDY

P.R. Healey, B. Taylor, J.J. Wang, E. Rochtchina, P. Mitchell
Centre for Vision Research, Westmead, Australia

Introduction: Optic disc haemorrhage (DH) is a well-known risk factor for glaucoma[1,2,3,4]. We have previously reported that the population prevalence of DH is higher than previously thought[5].
Aims: To determine the frequency and associations of new episodes of DH detected in an the same population at 5- and 10-year follow-up examinations.
Methods: Stereoscopic optic disc photographs were taken of 3654 baseline participants aged 49+ years in the Blue Mountains Eye Study. At the 5- and 10-year examinations, 2334 and 1953 participants were examined (75.1% and 75.0% of survivors at each interval). 2236 and 1624 persons had gradable photographs at the 5-year and 10-year exams. DH were identified from stereoscopic optic disc photographs (35 mm film) by trained graders and confirmed by an ophthalmologist (PM). Incident episodes were defined when a DH was detected at the 5- or 10-year exams in eyes without DH at baseline.
Results: Among the 51 persons who had a DH at baseline, 5 of 22 (22.7%) who were re-examined at 5 years had further DH at different locations in the same eye; none of 14 who were re-examined at 10 years had further haemorrhages. After excluding the 5 persons who were found to have bilateral haemorrhages at baseline, 2233 persons at 5-year and 1622 persons at 10-year exams were considered at risk. The overall incidence of DH in either or both eyes was 1.16% (26 persons, 28 eyes) at the 5-year and 1.91% (32 persons, 35 eyes) at the 10-year exams. Incident episodes of DH were associated with increasing age (OR, 1.5 per decade; CI, 1.1-2.0) and vertical cup-disc (CD) ratio greater than 0.5 at baseline (OR, 2.6; CI, 1.5-4.5), after adjusting for age and vertical optic disc diameter. DH were more frequent in left than right eyes (OR, 2.1; CI, 1.3-3.4). Potential risk factors including baseline hypertension, diabetes, BP or IOP were also assessed and no significant associations were found. Gender, regular use of aspirin and history of self-reported migraine history were also not related to incident DH. Relation to glaucoma will be discussed.
Conclusions: Our data indicate a higher 5-year incidence of new disc haemorrhage episodes (1.2%) than reported from the Beaver Dam eye study (0.4%). Due to the transient nature of optic disc haemorrhages, our reported incident episodes from this population-based cohort study are likely to considerably underestimate the true incidence.

References:

1. Drance SM, Begg IS. Sector haemorrhage – a probable acute ischaemic disc change in chronic simple glaucoma. Can J Ophthalmol 1970;5:137-41. **2.** Drance SM, Fairclough M, Butler DM, Kottler MS. The importance of disc hemorrhage in the prognosis of chronic open angle glaucoma. Arch Ophthalmol 1977;95:226-8. **3.** Airaksinen PJ, Mustonen E, Alanko HI. Optic disc haemorrhages precede retinal nerve fibre layer defects in ocular hypertension. Acta Ophthalmol 1981;59:627-41. **4.** Bengtsson B, Holmin C, Krakau CE. Disc haemorrhage and glaucoma. Acta Ophthalmol 1981;59:1-14. **5.** Healey PR, Mitchell P, Smith W, Wang JJ. Optic disc hemorrhages in a population with and without signs of glaucoma. Ophthalmology 1998;105:216-23.

P007 THE PREVALENCE OF OPTIC DISC PITS

P.R. Healey, P. Mitchell
Centre for Vision Research, Westmead, Australia

Introduction: A pit of the optic disc was first reported in 1882[1] and an acquired pit in 1951[2]. Radius described incident pits of the optic nerve in open-angle glaucoma, both clinically and histologically demonstrating an association with glaucoma, progression and low tension glaucoma, and limitation to within the substance if the lamina cribrosa[3]. Subsequently a number of authors confirmed these findings in clinic-based studies[4-7]. There are no epidemiological data on optic disc pits, precluding accurate estimates of prevalence or unbiased associations.
Aims: To describe the prevalence and associations of optic disc pits in a well-defined older population
Methods: Subjects were from the Blue Mountains Eye Study, a population-based survey of 3654 individuals over 49 years, living near Sydney during 1992-4. The presence of an optic disc pit was graded in a masked fashion from stereo-photographs. Open angle glaucoma (OAG) was diagnosed when typical glaucomatous visual field loss on the Humphrey 30-2 test matched optic disc rim loss.
Results: Disc photographs were gradable in 98% of participants. Optic disc pits were found in 12 eyes of 10 patients, a prevalence of 0.17%. Pit prevalence increased with age (B=0.063, p=0.0291) from 0.05% for ages 49-59, 0.15% for ages 60 to 69, 0.21% for ages 70 to 79 years and 0.43% for 80+ years. Five pits were found in subjects with OAG (OR 19 95CI 5-69 age-sex adjusted). All had IOPs> 21mmHg at the time of examination. Six pits were found in eyes with beta-peripapillary atrophy (OR 4.1 95CI 1.2-13.3 age-sex adjusted) and 3 in eyes with a disc haemorrhage (OR 31 95CI 8-125 age-sex adjusted).
Conclusions: These data give an estimate of the population prevalence of optic disc pits. They suggest that in an older population, optic disc pits are principally associated with glaucoma and the peripapillary signs of disc haemorrhage and beta-peripapillary atrophy. Pit prevalence was similar in high pressure OAG to a previous clinic-based study[5]. The higher prevalence of pits in normal tension glaucoma found in 2 previous studies[4,5] may be due to a referral bias favouring patients with more obvious abnormalities of the disc.

References:

1. Wiethe T, Ein Fall von angeborener Difformität der Sehnervenpapille. Arch f. Augenh. 1882;11: 14-19 **2.** Gayer MO. Acquired hole in the disc. Br J Ophthalmol 1951;35:437-9. **3.** Radius RL, Maumenee AE, Green WR. Pit-like changes of the optic nerve head in open-angle glaucoma. Br J Ophthalmol 1978;62:389-93. **4.** Javitt JC, Spaeth GL, Katz LJ, *et al*. Acquired pits of the optic nerve. Increased prevalence in patients with low-tension glaucoma. Ophthalmology 1990;97:1038-43. **5.** Nduaguba C, Ugurlu S, Caprioli J. Acquired pits of the optic nerve in glaucoma: prevalence and associated visual field loss. Acta Ophthalmol Scand 1998;76:273-7. **6.** Ugurlu S, Weitzman M, Nduaguba C, Caprioli J. Acquired pit of the optic nerve: a risk factor for progression of glaucoma. Am J Ophthalmol 1998;125:457-64. **7.** Caprioli J, Spaeth GL. Comparison of the optic nerve head in high- and low-tension glaucoma. Arch Ophthalmol 1985;103:1145-9.

P008 GONIOSCOPIC DISTRIBUTION IN LATIN-AMERICAN ADULTS. ANALYSIS OF GONIOSCOPY IN 4913 EYES OF LATINOS 40 YEARS OR OLDER

Z. Montenegro
Fundación Santafé de Bogota, Bogota, Colombia

Clinical Objective: To describe the gonioscopic appearance of eyes in a Latin American population and correlate it with the occurrence of primary glaucoma new cases.
Design: Observational longitudinal case control study
Participants: 2492 latin-american patients of 40 years or older seeking primary ophthalmological care at the Fundación Santa Fé de Bogota (FSFB) Colombia.
Methods: Comprehensive adult initial eye examination and gonioscopic description were kept in an electronic database for future analysis.
Primary outcome: Classification of the angle aperture.
Secondary outcome: Initial glaucoma diagnosis.
Results: 4913 eyes of 2494 patients were analyzed. 93% eyes had open angle and 1.6% showed closed angle. We established an initial diagnosis of glaucoma and/or angle alteration in 287 patients. 6% of the patients were glaucoma suspects. In 3% of the individuals chronic primary open angle glaucoma was confirmed. In 1.35 % of the patients we established a diagnosis of closed angle glaucoma, and in an additional 1.9% of the patients the angle was narrow.
Conclusion: There is a predominance of open angle in this Latin American group of individuals. The addition of primary closed angle glaucoma cases and patients at risk of angle closure is larger than the number of established primary open angle glaucoma cases.

References:

1. Gomez J.J. Frecuencia del glaucoma primario de angulo estrecho-cerrado en Antioquia. Rev Soc. Col. Oftal.1981; XII, 4:184-185. **2.** Hollows FC, Graham PA. Intra-ocular pressure, glaucoma, and glaucoma suspects in a defined population. Br J Ophthalmol 1966; 50:570-86. **3.** Bengtsson B. The prevalence of glaucoma. Br J Ophthalmol 1981; 65:46-9. **4.** Bankes JLK, Perkins ES, Tsolakis S, Wright JE. Bedford glaucoma survey. Br Med J 1968; 1:791-6. **5.** Arkell SM, Lightman DA, Sommer A. *et al*. The prevalence of glaucoma among Eskimos of northwest Alaska. Arch Ophthalmol 1987; 105:482- **6.** 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. **7.** Foster PJ, Baasanhu J, Alsbirk PH. *et al*. Glaucoma in Mongolia. A population-based survey in Hövsgöl Province, Northern Mongolia. Arch Ophthalmol 1996; 114:1235-41.

P009 THE SYSTEMIC MEDICATION BURDEN OF GLAUCOMA PATIENTS

A.L. Robin[1], D. Covert[2]
[1]Johns Hopkins University, Baltimore, MD, United States of America, [2]Alcon Laboratories, Fort Worth, TX, United States of America

Introduction: Patients with glaucoma are usually older and therefore more likely to have systemic diseases requiring medical therapy. Adherence to therapy has been associated with the complexity of therapy, including the number and amount of copays, number of medications, and frequency of medication dosing. We have previously looked at glaucoma adherence in terms of number of glaucoma medications, but have not considered the burden of systemic medical therapies.
Aim of Study: This study is one of the first evaluating the total burden of systemic medications that relatively healthy ocular hypertensives and early glaucoma patients may face.
Methods: We evaluated the data bases of a recent one-year glaucoma study that compared travoprost to timolol. We evaluated the most common systemic diseases, average number of scripts per patient (ANSPP), and average doses per day (ANDPD).
Results: 262 subjects with either ocular hypertension or early glaucoma completed the study. The mean age was x years with a median of z and Y % were female. 76% had another systemic medical problem; the most common was systemic hypertension (49%, 1.6 (ANSPP), (1.8 ADPD). 24.9% of patients were on >/= 4 medications required 4.2 doses per day. 9.6% were taking 6 or more systemic medications requiring more than 6 doses per day.
Discussion: Poor compliance is associated with higher IOPs and more visual field loss. Compliance is related to complexity of therapy. Although not asked, many were probably on aspirin therapy, vitamins, calcium supplements, and proton pump inhibitors. This study involved subjects who were relatively, and may be on fewer medications than actual glaucoma patients who did not qualify for this study.
Conclusions: This study is the first to evaluate the burden of systemic medications in glaucoma patients and found that 25% of subjects required more than four medications with multiple doses per days.

References:

1. Blackwell B. Treatment adherence. Br J Psychiatry 1976;129:513-31. **2.** Goldman DP, Joyce GF, Escarce JJ, *et al*. Pharmacy benefits and the use of drugs by the chronically ill. JAMA 2004;291:2344-50. **3.** Stewart WC, Chorak RP, Hunt HH, Sethuraman G. Factors associated with visual loss in patients with advanced glaucomatous changes in the optic nerve head. Am J Ophthalmol 1993;116:176-81.

P010 GLAUCOMA AND EYE SOLUTION THERAPY'S EFFECT ON QUALITY OF LIFE, A TIME TRADEOFF UTILITY ANALYSIS

S. Kogure, N. Fujumaki, M. Sato, S. Tsukahara
University of Yamanashi, Yamanashi, Japan

Purpose: To investigate how glaucoma and ophthalmic solutions affect the quality of life (QOL) of Japanese patients.
Design: Cross-sectional utility value assessment.
Participants: 165 consecutive glaucoma patients at the glaucoma clinic of University of Yamanashi Hospital.
Methods: Glaucoma patients were interviewed using a standardized time tradeoff utility value assessment and our original questionnaire. A stepwise multiple linear regression analysis was performed to determine whether demographic, clinical, or visual field parameters correlate with time tradeoff (TTO) utility scores. TTO score for cure their glaucoma completely and/or quit eye solution with same efficacy.
Main outcome measures: TTO utility scores ranged from 1.0 (health and no influence on QOL) to 0.0 (equal to death). Decreased TTO utility score by glaucoma or medical therapy. Correlating parameters for TTO utility score.
Results: The mean TTO utility scores for glaucoma and medical therapy are 0.887±0.16 and 0.929±0.126, respectively. Glaucoma duration was the most highly correlated with a TTO utility score (p=0.0305), visual acuity in the better-seeing eye (p=0.0644) approached significance. The number of instillation per single day was not correlated with TTO utility score for medical therapy. (p=0.3905)
Conclusions: In Japanese glaucoma patients, glaucoma duration and visual acuity in the better-seeing eye were major factors related to the QOL of patients. The influence of medical therapy on QOL was small. The number of instillation per single day was not correlated with QOL of patients

References:

1. Hosoda M *et al*: Quality of life in glaucoma patients. Rinsho Ganka (Japanese Journal of Clinical Ophthalmology) 1995;49:1355-1358. **2.** Uenishi Y *et al*: Quality of life of elderly Japanese patients with glaucoma. Int J Nurs Pract 2003;9:18-25. **3.** Janz NK *et al*: The Collaborative Initial Glaucoma Treatment Study: interim quality of life findings after initial medical or surgical treatment of glaucoma. Ophthalmology 2001;108:1954-65. **4.** Nordmann JP *et al*: Vision related

quality of life and topical glaucoma treatment side effects. Health Qual Life Outcomes. 2003; 10:75. **5.** Brown MM *et al*: Quality of life associated with visual loss. Opthalmology 2003;110:1076-1081.

P011 ASSESSING QUALITY OF LIFE IN GLAUCOMA PATIENTS USING THE GLAUCOMA QUALITY OF LIFE -15 (GQL-15) QUESTIONNAIRE

I. Goldberg[1], C. Clement[1], T.H. Chiang[2], J.G. Walt[2], A. Ravelo[2], S.L. Graham[1], P.R. Healey[1]
[1]Eye Associates, Sydney, Australia, [2]Allergan Inc, Irvine, CA, United States of America

Objective: We assessed QOL using the GQL-15 in a cohort of patients with OAG and correlated self-reported visual disability with objective measures of visual function.
Design: Despite an insidious onset without symptoms, patients with open-angle glaucoma (OAG) may experience difficulty with daily activities from its early stage onwards. A new questionnaire, the GQL-15, has been specifically developed to assess quality of life (QoL) in glaucoma patients by measuring severity of visual disability for five key activity groups: (i) central and near vision, (ii) peripheral vision, (iii) dark adaptation and glare, (iv) personal care and (v) outdoor mobility.
Participants: Patients with and without OAG attending an urban glaucoma practice and meeting the study 's exclusion criteria were enrolled from May to October 2004.
Methods: All performed achromatic perimetry using a Humphrey Field Analyser (HFA) prior to completing the GQL-15. Information on glaucoma type, current treatment, visual acuity, HFA mean deviation (MD), HFA pattern standard deviation (PSD) and number of binocular points missed (≤ 20 degrees radius) were collected. Correlation coefficients were calculated using the Spearman's correlation test.
Results: 121 patients with OAG and 31 controls were enrolled. On a scale from 15 (no visual disability) to 75 (severe disability for all visual tasks), the mean GQL-15 summary score was 18.5 for controls and 30.5 for OAG. The GQL-15 summary score was significantly correlated with visual acuity (r=-0.39701, p<0.0001), MD (r=-0.47043, p<0.0001), disease severity (r= 0.49278, p<0.0001), and number of binocular points missed (r=0.55821, p<0.0001). GQL-15 summary scores were significantly higher in patients with early (p<0.0019), moderate (p<0.0001) or advanced OAG (p<0.0001) compared to control.
Conclusion: By using the GQL-15 questionnaire, we have demonstrated that patients with OAG report a decline in QoL compared to individuals without glaucoma. Reduced QoL in these patients correlates strongly with reduced VA, severity of visual field defects and presence of binocular field defects. Further analysis will reveal whether specific visual functions, such as glare and dark adaptation, are affected preferentially in early, moderate or advanced OAG.

P012 THE VALIDITY OF SCREENING FOR GLAUCOMATOUS OPTIC NERVE DAMAGE USING CONFOCAL SCANNING LASER OPTHALMOSCOPY (HRT II) IN HIGH-RISK POPULATIONS: A PILOT STUDY

P. Harasymowycz, D. Papamatheakis, A. Kamdeu-Fansi, M.R. Lesk
Université de Montréal, Montréal, Québec, Canada

Purpose: To evaluate whether confocal scanning laser ophthalmoscopy (HRT II) is a valid tool for the detection of glaucomatous optic nerve damage.
Design: This was an observational, cross-sectional, non-consecutive study that took place in Montréal, Québec, Canada.
Participants: 303 non-continuous, 'high-risk' subjects were enrolled during a six month period.
Methods: Subjects underwent confocal scanning laser ophthalmoscopy (HRT II) testing, and a standard ophthalmologic examination, including gonioscopy, intraocular pressure measurement, and optic disc grading using cup-to-disc ratio and DDLS staging.[1]
Outcome measures: These included positive and negative Likelihood Ratios (LR; LR-), sensitivities and specificities, positive and negative predictive values (PPV; NPV) as well as kappa coefficients of agreement (k)[2] of Moorfields regression analysis (MRA)[3], Cup Shape Measure (CSM), Height Variation Contour (HVC) and Mean Retinal Nerve Fiber Layer Thickness (MRNFL). MRA test positive definition varied depending on whether 'borderline' results were grouped with either normal or 'outside normal limits' categories. Gold-standard glaucoma definitions varied depending on whether suspects were classified with normals or glaucoma.
Results: 303 subjects were enrolled, and of 291 examined clinically, 21 (7.2%) were found to have glaucoma. HRT II was successfully performed and of acceptable quality in 531 of 601 eyes (88%). When MRA was compared to clinical based diagnosis, weighted kappa coefficient was k=0.567 (95%CI:0.42-0.71) OD and k=0.516 (95%CI:0.37-0.66) OS. Best accordance was seen when 'normals' where grouped with suspects in both clinical and MRA diagnosis (k=0.604, 95%CI: 0.409-0.799; OD). Depending on 'gold-standard' and test positive definitions for glaucoma, specificity ranged from 87% to 97%, sensitivity from 25% to 100%, PPV from 28% to 68%, NPV from 84% to 100%, LR from 5 to 19.2 and LR- from 1.3 to 6.2.
When CSM, HVC and MRNFLT were compared to clinical diagnosis all outcome measures were lower: specificity from 46.9% to 83.7%, sensitivity from 36.5% to 76.9%, PPV from 6% to 36%, NPV from 80% to 99%, LR from 0.8 to 4, LR- from 0.9 to 3.
Conclusions: This study confirms[4] that a glaucoma screening program may be more effective in detecting POAG when targeting high risk populations. HRT II may prove to be a useful tool in detecting glaucomatous optic nerve damage, and could be used as part of a complete glaucoma screening protocol.
References:
1. Bayer A, Harasymowycz P, Henderer JD, *et al*. Validity of a new disk grading scale for estimating glaucomatous damage: correlation with visual field damage. Am J Ophthalmol 2002; 133:758-63. **2.** Landis RJ, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159-174. **3.** Wollstein G, Garway-Heath DF, Hitchings RA. Identification of early glaucoma cases with the scanning laser ophthalmoscope. Ophthalmology 1998;105: 1557-63. **4.** Quigley HA. Current and future approaches to glaucoma screening. J Glaucoma 1998;7:210-20.

P013 SCREENING FOR EYES AT RISK FOR ANGLE-CLOSURE GLAUCOMA BY NONPHYSICIAN OPERATED SCANNING PERIPHERAL ANTERIOR CHAMBER DEPTH ANALYZER

K. Kashiwagi, T. Fujimaki, M. Tanaka, A. Nakazawa, N. Shimizu, K. Saito, N. Aikaike, J. Nakayama, S. Tsukahara
University of Yamanashi, Nakakoma-Gun, Japan

Purpose: Aim of this study is to screen eyes at risk for angle-closure glaucoma (ACG) by non-physicians using newly developed full-automated scanning peripheral anterior chamber depth analyzer (SPAC)[1] in health examination.
Methods: Residents of 40 years or older were subject to this study in Tamaho town Yamanashi Japan. Non-physicians operated SPAC in the primary health examination for screening eyes at risk for ACG. SPAC automatically measured peripheral anterior chamber depth (PACD) and categorized enrolled eyes into four groups according to the previous results[2] (group 1: low risk for ACG, group 2: having moderately or slightly shallow anterior chamber, group 3: having shallow anterior chamber and at high risk for ACG, group 4: impossible to be judged). All eyes categorized group 3 were subject to the secondary examination. Eyes belonging to groups 2 and 4 were confirmed to be free from risk for ACG by ophthalmologists. In the secondary examination glaucoma specialists diagnosed those high risk eyes by examinations using gonioscope and ultrasound bio-microscope, and loading tests such as prone position test.
Results: Of 624 subjects who attended the primary examination, SPAC determined sixty-five subjects belonging to group 3. Sixty-four subjects attended the secondary examination and one eye with primary angle-closure glaucoma, 21 eyes with primary-angle closure, and 13 eyes primary angle-closure suspect were diagnosed. Among these subjects none have any ocular symptom associated with ACG and only two subjects were previously diagnosed.
Conclusion: SPAC may be useful for screening eyes at risk for ACG by non-physicians operating health examinations.
References:
1. Kashiwagi K, Kashiwagi K, Toda Y, *et al*. A newly developed peripheral anterior chamber depth analysis system - principle, accuracy, and reproducibility-. Br J Ophthalmol. 2004;88:1029-1034. **2.** Kashiwagi K, Kashiwagi K, Hiejima Y, Tsukahara S. Finding cases of angle-closure glaucoma in clinic setting using a newly developed instrument. Eye (in press).

2. ANATOMICAL STRUCTURES

P014 VISUALIZATION OF THE AQUEOUS OUTFLOW PATHWAY BY FINITE ELEMENT MODEL OF THE EYE. AN ATTEMPT TO MODELIZE THE DRAINAGE DEVICE FUNCTION

J. Broquet, S. Roy, A. Mermoud
Ophtalmic Eye Hospital Jules Gonin, Lausanne, Switzerland

Objective: To provide a synthetic model of the eye that analyzes the hydrodynamic parameters of the aqueous humor outflow after drainage surgery.
Design: Experimental study based on the reproduction of the aqueous outflow pathway by finite element model of the eye.
Controls: Simulations were conducted in five models of normal eyes, then on modified eyes simulating drainage device surgery.
Methods: Computer simulation allows identification and visualization of the main components of the outflow facility that play a key role in the dynamic of aqueous outflow. The effect of outflow facility changes after glaucoma surgery by the mean of drainage devices can be simulated and modification of the resistance to aqueous egress can be depicted. A computer model of the anterior segment of the eye has been designed. Ciliary body, anterior hyaloids membrane, posterior chamber, lens, iris, anterior chamber, iridocorneal angle, trabecular meshwork, Schlemm's canal, collector channels, aqueous veins and conjunctiva were defined. After initial conditions for the flow parameters (inlet volume and output pressure) were assigned the program was initiating the aqueous flow in respect with the velocity, force, pressure, resistance and temperature parameters in the 3D structure of a virtual eye. Drainage devices consisted in a small-bore tube implanted between the anterior chamber and the subconjunctival space.
Main outcome measures: Pressure gradient: 7.5 mmHg. Velocity: 10 m/s. Aqueous flow: 2 l/min. Trabeculum resistance: 1.01*10-5kgm-4s-1. Drainage device resistance: 0.91*10-5kgm-4s-1.
Results: The pressure gradient and the velocity vectors showed that the most important drop in pressure or changes in velocity occurred in normal at the trabeculum/Schlemm's canal interface. The lines of flow were converging to the iridocorneal angle, flowing through the trabeculum, and Schlemm's canal into collector channels in normal and through drainage device in models of drainage surgery.
Conclusions: Computer simulation using the finite element model to represent the hydrodynamic proprieties of the aqueous pathway enables good visualization of the lines of flow. Dynamic characteristics in respect with velocity and pressure gradient along the several drops of resistance can be clearly depicted. Most of the resistance to aqueous egress occurs at the trabeculum and Schlemm's canal interface in normal and through the drainage device after surgery simulation. Refinements in the drainage device geometry and function can be designed and visualized.
References:
1. Chung T.J., Computational Fluid Dynamics, Cambridge University Press, 2002. **2.** Bill A. The role of ciliary body blood flow and ultrafiltration in aqueous humour formation. Exp Eye Res 1973;16:287. **3.** Reddy DVN. Dynamics of transport systems in the eye. Invest Ophthalm Vis Sci 1979;18:1000. **4.** Bill A, Svedbergh B. Scanning electron microscopic studies of the trabecular meshwork and the canal of Schlemm's: an attempt to localize the main resistance to outflow of aqueous humour in man. Acta Ophthalmol (Copenh) 1972;50:295. **5.** Bill A. Uveoscleral drainage of aqueous humour in human eyes. Exp Eye Res 1971;12:275.

P015 MALONDIALDEHYDE AS A MARKER OF OXIDATIVE STRESS IN THE SERUM AND THE AQUEOUS HUMOR IN NON-GLAUCOMATOUS AND GLAUCOMATOUS EYES

C. Faschinger, O. Schmut, C. Kirchengast, G. Mossboeck
Medical University of Graz, Graz, Austria

Introduction: Oxidative stress may probably be one of the numerous factors inducing cell damage in glaucoma.
Aim of the study: To compare an oxidative stress marker in non-glaucomatous eyes to eyes with pseudoexfoliation syndrom and primary open angle glaucoma.
Methods: In this cross-sectional study samples of serum and aqueous humor of non-glaucomatous eyes (112) and eyes with pseudoexfoliation syndrom (29) and primary open angle glaucoma (29) were analyzed for thiobarbituric acid-reacting substances (TBARS).
Results: The mean of the TBARS in the serum of the control group (non-glaucomatous eyes) was 1.15 µM/L (range 2.34-0.10), in the aqueus humor 0.33 (1.04-0.04), in the eyes with pseudoexfoliation 1.11 (2.25-0.31) and 0.35 (0.79-0.10), in the eyes with primary open angle glaucoma 1.14 (2.26-0.26) and 0.32 (0.94-0.04), respectively. There was no statistical significant difference to the results of the control group.
Conclusion: Lipid peroxides like malondialdehyde result as an oxidative product of lipid acids of the cellular membrane and are therefore markers of oxidative stress damage. We found no statistical significant difference betwen a control group and eyes with pseudoexfoliation syndrom and eyes with primary open angle glaucoma.
References:
1. Nielsen F, Mikkelsen BB, Nielsen JB, Andersen HR, Grandjean P. Plasma malondialdehyde as biomarker for oxidative stress: reference interval and effects of life-style factors. Clin Chem 1997;43:1209-1214 **2.** Tamm ER, Russell P, Johnson DH, Piatigorsky J. Human and monkey trabecular meshwork accumulate αB-crystallin in response to heat shock and oxidative stress. Invest Ophthalmol Vis Sci 1996;37:2402-2413 **3.** Izzotti A, Sacca SC, Cartiglia C, De Flora S. Oxidative deoxyribonucleic acid damage in the eyes of glaucoma patients. Am J Med 2003; 114:638-656 **4.** Ferreira SM, Lerner SF, Brunzini R, Evelson PA, Llesuy SF. Oxidative stress markers in aqueus humor of glaucoma patients. Am J Ophthalmol 2004;137:62-69 **5.** Augustin AJ, Dick HB, Winkgen A, Schmidt-Erfurth U. Ursache und Prävention oxidativer Schäden am Auge. Ophthalmologe 2001;98:776-797 **6.** Zhou L, Li Y, Yue BYJT. Oxidative stress affects cytoscel*et al* structure and cell-matrix interactions in cells from an ocular tissue: the trabecular meshwork. J Cell Physiol 1999;180:182-189.

P016 DENDRITIC PATHOLOGY IN LATERAL GENICULATE NEURONS OF THE BRAIN OCCURS EARLY IN GLAUCOMA

N. Gupta[1], Q. Zhang[1], R.N. Weinreb[2], P.L. Kaufman[3], C. Rasmussen[3], Y.H. Yucel[1]
[1]University of Toronto, Toronto, Canada, [2]Hamilton Glaucoma Center, La Jolla, CA, United States of America, [3]University of Wisconsin, Madison, WI, United States of America

Purpose: To determine whether dendrites of LGN neurons, responsible for integrating synaptic responses from retinal ganglion cells and visual cortex inputs, show pathological changes following experimental primate glaucoma.

Design: Experimental study
Participants: Six adult monkeys (Macaca fascicularis) with chronic ocular hypertension and varying degrees of optic nerve fiber loss in the right eye (0%, 1%, 17%, 29%, 61%, 90%) and five normal control monkeys were studied.
Methods: Brains with right eye unilateral experimental glaucoma were serially sectioned and left LGN neurons (layers 1, 4, 6) studied. The dendrites of LGN neurons were visualized with an antibody against microtubule-associated protein-2 (MAP-2), the major structural protein restricted to dendrites.
Main outcome measures: Morphology and arborization of LGN neuron dendrites.
Results: MAP-2 positive dendrites of lateral geniculate neurons in layers 1,4, and 6 were distinctly disorganized, shorter, and fragmented compared to controls. These dendritic changes were present whether glaucomatous damage was early, moderate or advanced. Furthermore, the striking architectural changes were noted in LGNs with ocular hypertension without significant optic nerve fiber damage.
Conclusion: Dendritic pathology of lateral geniculate neurons in the brain occurs early following elevated intraocular pressure. Alterations at these sites of synaptic integration may contribute to the earliest visual dysfunctions in glaucoma, and may be a target for therapeutic interventions prior to cell death.
References:
1. Y.H. Yücel, Q. Zhang, N. Gupta, P.L. Kaufman, and R.N. Weinreb. Loss of neurons in magno and parvocellular layers of the lateral geniculate nucleus in glaucoma. Archives of Ophthalmology, 118: 378-384, 2000. **2.** Y.H. Yücel, Q. Zhang, R.N. Weinreb, P.L. Kaufman and N. Gupta. Atrophy of relay neurons in magno-and parvocellular layers of the lateral geniculate nucleus in glaucoma. Investigative Ophthalmology and Visual Science, 42: 3216-3222, 2001. **3.** A.J. Weber, H. Chen, W. C. Hubbard, P. L. Kaufman. Experimental glaucoma and cell size, density, and number in the primate lateral geniculate nucleus. Investigative Ophthalmology and Visual Science, 41;, 1370-1379, 2000. **4.** Y.H. Yücel, Q. Zhang, R.N. Weinreb, P.L. Kaufman, N. Gupta. Effects of retinal ganglion cell loss on magno-, parvo-, koniocellular pathways in the lateral geniculate nucleus and visual cortex in glaucoma. Progress in Retinal and Eye Research, 22: 465-481, 2003. **5.** N Gupta and YH Yücel. Brain changes in glaucoma. European Journal of Ophthalmology, 13: 32-35, 2003. **6.** A. Luthra, N. Gupta, P.L. Kaufman, R.N. Weinreb, Y.H. Yücel. Oxidative injury in neural and vascular tissue of the lateral geniculate nucleus in experimental glaucoma. Experimental Eye Research, 80:43-49; 2005.

P017 QUANTITATIVE MEASUREMENT OF MOUSE OPTIC NERVE PROJECTIONS TO THE BRAIN IN VIVO
J.D. Lindsey, M. Scadeng, J.G. Crowston, R.N Weinreb
University of California San Diego, La Jolla, CA, United States of America

Objective: To evaluate measurement of optic nerve projections to the mouse brain *in vivo* by magnetic resonance imaging (MRI) following intraocular injection of manganese.
Main message: Anesthetized Swiss white mice received one microliter intracameral injection of 0.125-1 M manganese chloride into the right eye. After 14-18 hours, the mice were anesthetized with isofluorane and T1-weighted, spin-echo 3-dimensional data sets were acquired of the eyes and brain using a 7-Tesla magnetic resonance imager. Tracer signal was readily detected in the optic nerve, optic chiasm, ventral optic tract, LGN, the superficial layers of the SC, and the visual cortex areas V1 and V2. Normalized image intensity relative to background was greater by 53% in the ipsilateral optic nerve and by 31% and 28% in the contralateral LGN and SC, respectively (N=5, P<0.02, paired *t* test). Analysis of visual cortex found the signals in contralateral areas V1 and V1 were increased by 7.5% and 6.8%, respectively (P<0.02 for both, paired *t* test).In repeated imaging sessions, the tracer signal remained bright for several days and gradually faded over the two weeks after injection. Three dimensional reconstructions of the visual system based upon threshold analysis allowed simultaneous visualization of all portions of the major retinal projections to the brain.
Conclusions: These results indicate that injection of manganese into the mouse eye yields reproducible increases in image signal in the major retinorecipient brain nuclei. Transynaptic delivery of manganese to V1-Ctx also was measured. These results support use of this method to evaluate optic nerve projections to the mouse brain *in vivo*.
Supported in part by NIH/NEI EY11008.
References:
1. Mabuchi F, Aihara M, Mackey MR, Lindsey JD, Weinreb RN. Regional optic nerve damage in experimental mouse glaucoma. Invest Ophthalmol Vis Sci. 2004;45:4352-4358. **2.** Mabuchi F, Lindsey JD, Aihara M, Mackey MR, Weinreb RN. Optic nerve damage in mice with a targeted type I collagen mutation. Invest Ophthalmol Vis Sci. 2004;45:1841-1845. **3.** Yucel YH, Zhang Q, Weinreb RN, Kaufman PL, Gupta N. Atrophy of relay neurons in magno- and parvocellular layers in the lateral geniculate nucleus in experimental glaucoma. Invest Ophthalmol Vis Sci. 2001;42:3216-3222. **4.** Pautler RG, Silva AC, Koretsky AP. In vivo neuronal tract tracing using manganese-enhanced magnetic resonance imaging. Magn Reson Med. 1998;40:740-748. **5.** Watanabe T, Frahm J, Michaelis T. Functional mapping of neural pathways in rodent brain in vivo using manganese-enhanced three-dimensional magnetic resonance imaging. NMR Biomed. 2004;17:554-568.

3. LABORATORY METHODS

P018 GENE EXPRESSION IN GLAUCOMATOUS RETINAS IMPLICATE THE TNF-MEDIATED PATHWAY IN RETINAL GANGLION CELL DEATH
N. Piri, J.M.K. Kwong, M. Song, J.C Caprioli
JSEI, UCLA, Los Angeles, CA, United States of America

Purpose: Identification of apoptotic mechanisms associated with retinal ganglion cell (RGC) death in glaucomatous retinas.
Methods: A rat glaucoma model was generated with chronic, moderately elevated intraocular pressure (IOP). The number of surviving cells in the ganglion cell layer (GCL) was estimated to evaluate the extent of RGC degeneration in the retinas of these animals. Gene expression profiles of the control and treated retinas were obtained with oligonucleotide microarrays that represent 22,000 genes and expressed sequence tags (ESTs). Data obtained from microarray experiments (n=3 for each time point) were clustered and analyzed with Microsoft Excel, EASE: the Expression Analysis Systematic Explorer, and Pathway Assist softwares. Real-time quantitative PCR and semi-quantitative RT-PCR were used to validate the changes in gene expression levels observed by the microarrays.
Results: The comparison of gene expression profiles obtained from the retinas two and five weeks after IOP elevation revealed 121 genes (24 of them have been characterized), the expressions of which were similarly affected. Corresponding proteins with known functions were clustered, based on their roles in biological processes with EASE software, and analyzed with the Pathway Assist software package to determine their interactions with other proteins and to build biological association networks. We found that 8 out of the 24 characterized genes, including guanylate kinase-interacting protein, hemopexin, and transcription factors NR2F2 (nuclear receptor subfamily 2), ELK1 (Ets family of transcription factors), BF-1 (proto-oncogene brain factor-1) are associated with tumor necrosis factor (TNF), mitogen-activated protein kinase 8 (MAPK8), and MAPK kinase kinase (MAP3K). TNF, MAPK8, and MAP3K are essential factors in the TNF-mediated apoptotic pathway.
Conclusions: Results of the gene expression profiling obtained from the retinas after IOP elevation suggest that TNF-mediated apoptotic cell death is an important mechanism involved in RGC degeneration in glaucomatous retinas.
References:
1. Park KH, Cozier F, Ong OC, Caprioli J. Induction of heat shock protein 72 protects retinal ganglion cells in a rat glaucoma model. Invest Ophthalmol Vis Sci. 2001; 42:1522-30. **2.** Yuan L, Neufeld AH. Tumor necrosis factor-***a***: a potentially neurodestructive cytokine produced by glia in the human glaucomatous optic nerve head. Glia. 2000; 32:42-50. **3.** Tezel G, Li LY, Patil RV, Wax MB. TNF-***a***and TNF-***a***receptor-1 in the retina of normal and glaucomatous eyes. Invest Ophthalmol Vis Sci. 2001; 42:1787-94. **4.** Tezel G, Yang X, Yang J, Wax MB. Role of tumor necrosis factor receptor-1 in the death of retinal ganglion cells following optic nerve crush injury in mice. Brain Res. 2004; 996:202-12. **5.** Vazquez-Chona F, Song BK, Geisert EE. Temporal changes in gene expression after injury in the rat retina. Invest Ophthalmol Vis Sci. 2004; 45:2737-46.

P019 RELEVANCE OF P38 IN TGF-β-INDUCED HUMAN TENON MYOFIBROBLAST TRANSDIFFERENTIATION
T Meyer-ter-Vehn[1], S Sieprath[2], F Grehn[1], P Knaus[3], G Schlunck[1]
[1]University Eye Hospital Würzburg, Würzburg, Germany, [2]University Eye Hospital, Würzburg, Germany, [3]Institute for Biochemistry, FU, Berlin, Germany

Purpose: Postoperative filtration bleb failure due to scar formation is still the most prominent problem in fistulating glaucoma surgery. TGF-β is a pivotal cytokine in this scarring process and specific inhibition of TGF-β signalling may therefore offer new treatment options. As our previous experiments had indicated a role of p38 in TGF-β signalling in human tenon fibroblasts, we investigated the functional significance of p38 in myofibroblast transdifferentiation.
Methods: Primary human tenon fibroblast (HTF) cultures were characterized by immunocytochemistry and treated with TGF-β. The time course of MAPK signalling and the influence of various kinase inhibitors on alpha smooth muscle actin (SMA) expression were assessed by Western Blot. On a functional level, the effects of TGF-β and kinase inhibitors were studied in 3D collagen gel contraction assays by morphometry and confocal laser microscopy.
Results: TGF-β activates p38 in a sustained biphasic manner, while ERK is activated briefly. The p38-inhibitors SB203580, SB239068 and SB220025 diminished TGF-β-induced SMA-expression, while the ERK-inhibitor U0216 had no effect. Both, spontaneous and TGF-β-induced collagen gel contraction were attenuated by SB203580 and slightly increased by U0216. p38-inhibitors decreased stress fiber formation in collagen-gel embedded HTF.
Conclusions: TGF-β-induced myofibroblast transdifferentiation is structurally and functionally attenuated by p38-inhibitors. Furthermore, intrinsic contraction of HTF-populated collagen gels is diminished by p38-inhibition. These data indicate a significant role of p38 in human tenon myofibroblast transdifferentiation. p38-inhibitors may therefore serve as additional agents to prevent postoperative scarring in glaucoma surgery.
References:
1. Grinnell, F., Fibroblasts, myofibroblasts, and wound contraction. J Cell Biol. 1994;124(4):401-4. **2.** J. J. Tomasek, G. Gabbiani, B. Hinz, C. Chaponnier and R. A. Brown, Myofibroblasts and mechano-regulation of connective tissue remodelling. Nat Rev Mol Cell Biol. 2002;3(5):349-63. **3.** Hinz, B. and G. Gabbiani, Mechanisms of force generation and transmission by myofibroblasts. Curr Opin Biotechnol. 2003;14(5):538-46. **4.** Schurch, W., Seemayer T.A., Gabbiani G., Histology for Pathologists, ed. S.S. Sternberg. Vol. p109-144. 1992: Raven Press, N.Y. **5.** Moussad, E.E. and D.R. Brigstock, Connective tissue growth factor: what's in a name? Mol Genet Metab, 2000;71(1-2): p. 276-92.

P020 FORCE GENERATION BY TENON'S FIBROBLASTS AND SIMULTANEOUS BEHAVIORAL IMAGING IN A DYNAMIC 3D ENVIRONMENT
A. H. Dahlmann[1], M. Eastwood[2], M. Bailly[1], P. T. Khaw[1]
[1]Institute of Ophthalmology, London, United Kingdom, [2]Westminster University, London, United Kingdom

Purpose: To study 1. cell morphology and cell-matrix interactions during the generation of force by Tenon's fibroblasts and 2. their response to external tension by real-time microscopy and simultaneous force measurement.
Design: Experimental *in vitro* study.
Participants and/or controls: Human Tenon's fibroblasts.
Methods: We used human Tenon's fibroblasts in a standard fibroblast-populated collagen matrix[1,2]. Based on a previously described device used to measure cell-generated forces[3] we developed a novel setup, the micro-culture force monitor. We measured the endogenous tension generated by cells over the first 20 hours after matrix preparation, as well as their reactive behavior to externally applied matrix tension. We simultaneously imaged cell morphology and matrix remodeling with phase, differential interference, and confocal reflection timelapse microscopy (Fig. 1 and 2). Openlab and Volocity software packages were used to analyse the 3 and 4D reconstructed timelapse series.
Main outcome measures: 1. dynamic cell protrusive activity, 2. contractile force generated by Tenon's fibroblasts.
Results: Tenon's fibroblasts contract collagen matrix with a force of 10-20 dyne per million cells. Cells generate force by repeatedly extending and retracting protrusions. The endogenous force reaches a plateau 5 hours after seeding the cells into the matrix, when cell protrusions have reached their maximum length. Cell migration across the matrix is rare and does not account for contractile force generation. Stretching the matrix from outside induces slight changes in cell shape. Cell-generated tension transiently relaxes, then returns to its original level.
Conclusions: The cells used in this study are involved in subconjunctival scarring after glaucoma surgery. To date, the cellular mechanisms causing bleb contraction were unknown. Dynamic cell protrusive activities have previously been demonstrated in fibroblast-populated collagen matrices, but no timelapse images were acquired[4,5]. This is the first report of simultaneous live cell imaging and measurement of force generated by Tenon's fibroblasts in a physiological 3D environment, and demonstrates that cell protrusive activity generates contractile forces. The unique setup presented here is also the first to allow analysis and comparison of the response of ocular cells to mechanical stimulation transmitted by the matrix. It will give us important insights into the exciting new field of cellular signaling in response to mechanical stimulation.
References:
1. Bell, E., B. Ivarsson, and C. Merrill, Production of a tissue-like structure by contraction of collagen lattices by human fibroblasts of different proliferative potential *in vitro*. Proc Natl Acad Sci U S A, 1979. 76(3): p. 1274-8. **2.** Porter, R.A., *et al.*, Ultrastructural changes during contraction of collagen lattices by ocular fibroblasts. Wound Repair Regen, 1998. 6(2): p. 157-66. **3.** Eastwood, M., D.A. McGrouther, and R.A. Brown, A culture force monitor for measurement of contraction forces generated in human dermal fibroblast cultures: evidence for cell-matrix mechanical signalling. Biochim Biophys Acta, 1994. 1201(2): p. 186-92. **4.** Grinnell, F., *et al.*, Dendritic fibroblasts in three-dimensional collagen matrices. Mol Biol Cell, 2003. 14(2): p. 384-95. **5.** Tamariz, E. and F. Grinnell, Modulation of fibroblast morphology and adhesion during collagen matrix remodeling. Mol Biol Cell, 2002. 13(11): p. 3915-29.

P021 SERUM AUTOANTIBODIES IN GLAUCOMA PATIENTS FROM GERMANY AND THE UNITED STATES: FURTHER IMPLICATIONS FOR AUTOIMMUNE MECHANISMS IN THE NEURODEGENERATIVE PROCESSES OF GLAUCOMA
F.H. Grus[1], S.C. Joachim[2], K. Bruns[3], M.B. Wax[4], N. Pfeiffer[5]

[1]University of Mainz, Mainz, Germany, [2]Dept. of Ophthalmology, Mainz, Germany, [3]Dept. of Clinical Chemistry, Mainz, Germany, [4]Alcon Labs., Fort Worth, TX, United States of America, [5]Department of Ophthalmology, Mainz, Germany

Purpose: Glaucoma is characterized by a progressive loss of retinal ganglion cells that results in a characteristic optic neuropathy associated with visual field loss. In previous studies changes in the antibody profiles 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. The aim of this study was to compare the antibody profiles against optic nerve antigens in glaucoma patients in two different study populations from Germany and the United States.
Materials and methods: 120 patients were included in this study, 60 from Germany and 60 from the United States: a control group (CTRL, n=20), a group consisting of patients with primary open-angle glaucoma (POAG, n=20), and one of normal tension glaucoma patients (NPG, n=20) from each country. Western blots against bovine optic nerve antigens were used to detect the IgG antibody patterns present in patient serum. The complex antibody profiles were analyzed by multivariate statistical techniques.
Results: Complex IgG autoantibody repertoires were present in all glaucoma patients as well as healthy subjects from both the German and the United States study population. A large similarity between all antibody profiles in both study populations could be demonstrated in the number and frequency of both up- and down-regulation of antibody reactivities in glaucoma patients of both national cohorts. The multivariate analysis of discriminance found a significant difference between the glaucoma groups and healthy subjects against optic nerve antigens. As in previous studies, the NPG group revealed the highest variance from controls ($P<0.01$). Furthermore, a newly described antibody biomarker in both study populations was identified as alpha-fodrin.
Conclusions: We found that complex IgG antibody patterns against optic nerve antigens can be reproducibly identified in the serum of study populations from the US and Germany. Glaucoma patients have characteristic differences of serum autoantibody repertoires from control patients that are similar in both cohorts. A newly described autoantibody to alpha fodrin found in other neurodegenerative diseases such as Alzheimer's, further implicate a role for autoimmunity and the neurodegenerative processes in glaucoma. The high correspondence of the autoantibody patterns found in the study populations from different continents provides further evidence that serum autoantibody patterns might be useful biomarkers for glaucoma detection or prognosis in future studies by means of pattern matching algorithms.

P022 FAS/FADD MEDIATED DEATH SIGNAL IN EXPERIMENTAL GLAUCOMA RAT MODEL

J.I. Moon, C.K. Park, H.S. Kim, J.H. Kim
College of Medicine, The Catholic Univ., Seoul, South-Korea

Introduction: Many studies have reported that apoptosis can contribute to the loss of retinal ganglion cells in glaucoma and experimental glaucoma models. Apoptosis depends on cascades of signalling events. This study focused on the receptor-based induction of apoptosis by investigating Fas ligand (Fas L) and FADD, which initiate apoptosis by binding to their surface receptor, Fas.
Aim of the study: To understand the retinal ganglion cell death mechanism, we investigated the involvement of Fas, Fas ligand and FADD (Fas Associated Death Domain/Mort1), which play an important role in neuronal and retinal cell death, in a rat model of glaucomatous disease with chronic elevation of IOP.
Methods: Three episcleral veins on the ocular surface of rats were cauterized. Several cell death programs represented by Fas ligand, FADD (Fas Associated Death Domain/Mort1) and the caspase cascade (caspase–8 and –3), respectively, were examined in total retinal protein lysates and fixed retinal tissue by western blotting and immunohistochemistry.
Results: Both the insoluble (39 kDa) and soluble (29 kDa) forms of Fas ligand were present, and that the expression levels of each were slightly higher during the experimental period. FADD expression was also somewhat higher, showing a similar expression level to Fas ligand. Densitometric analysis showed that at one week, there was a 1.5-fold increase in Fas ligand and FADD when compared with normal retinas. At six weeks, increased FADD expression was maintained. In comparison, Fas ligand expression increased further, peaking at six weeks to a level 2-fold higher than normal retinas. Furthermore, we observed that cellular localization of these molecules, Fas and FADD, is mainly retinal ganglion cell on injured retina. Also, active caspase–8 and –3 immunoreactivity was only observed in RGCs.
Conclusion: Conclusively, irreversible glaucoma, caused by retinal ganglion cell death, seems to be regulated by a variety of mechanisms. Most importantly, Fas/FADD mediated cell death signal appear to occur mainly in retinal ganglion cell after chronic ocular hypertension due to chronic IOP elevation and blockade of retrograde flow.
References:
1. Ashkenazi A, Dixit VM. (1998). Death receptors: signaling and modulation. Science. 281(5381), 1305-1308 **2.** Brunner T, Mogil RJ, LaFace D, *et al.* (1995). Cell-autonomous Fas (CD95)/Fas-ligand interaction mediates activation-induced apoptosis in T-cell hybridomas. Nature. 373, 441-444 **3.** Garcia-Valenzuela E, Shareef S, Walsh J, Sharma SC. (1995). Programmed cell death of retinal ganglion cells during experimental glaucoma. Exp. Eye Res. 61, 33-44 **4.** Gomez-Angelats M, Cidlowski JA. (2003). Molecular evidence for the nuclear localization of FADD. Cell Death and Differ. 10, 791-797 **5.** Kavurma MM, Khachigian LM. (2003). Signaling and transcriptional control of Fas ligand gene expression. Cell Death and Differ. 10, 36-44 **6.** Laquis S., Chaudhary P., Sharma S.C. (1998). The patterns of retinal ganglion cell death in hypertensive eyes. Brain Res. 784, 100-104

P023 REDUCTION OF VITREUS VOLUME FOLLOWING IOP ELEVATION WITH SUCTION CUP

C. Koeppl, C. Vass, W. Drexler, O. Findl
Medical University of Vienna, Vienna, Austria

Introduction: One theory concerning primary angle closure glaucoma (PACG) involves increase of choroidal volume and poor conductivity of the vitreous as two new causal factors. Vitreous conductivity is the facility of water to pass through the vitreous into the posterior chamber of the eye. This study presents evidence for the vitreous conductivity in a living eye.
Aim of the study: To investigate the effect of short term IOP elevation and reduction on ocular structures *in vivo*.
Methods: Eighteen healthy volunteers participated in this pilot study. Intraocular pressure was elevated by 10 mmHg and 20 mmHg for 8 minutes each using a suction cup. Measurements were performed at baseline, at every IOP elevation step and 10 minutes after removal of the suction cup. We measured axial eye length (AEL), anterior chamber depth (ACD) and lens thickness (LT) using laser interferometry.
Results: Mean IOP was increased from 14 mmHg to 24 mmHg and 34 mmHg at the 2 suction levels, and decreased to 8 mmHg immediately thereafter. AEL increased significantly by 23 ± 19 µm and 39 ± 22 µm at the 2 suction levels and decreased by -7 ± 12 µm compared to baseline thereafter. ACD did not change during suction, but significantly increased after the end of suction by 30 ± 11 µm compared to baseline. LT increased slightly by 8 ± 10 µm and 10 ± 12 µm at IOP elevation by 10 mmHg, and 20 mmHg over baseline. After the end of suction a minimal increase of LT of 6 ± 8 µm compared to baseline could be detected.
Conclusion: The significant reduction of AEL after the end of suction may be explained by the increased choroidal volume as a result of reduced IOP. The finding of simultaneous ACD increase has been surprising for the authors. Increased outflow of aqueous humor (AH) during oculopression should result in reduced AH volume and thus in a reduction of ACD. The fact of simultaneous reduction of AEL and increase of ACD and LT reflects a reduction of vitreous volume. Combining the calculated volume reduction as a result of the reduced AEL (6µl) and the effect of backward movement of the anterior vitreous surface (10 µl) the total loss of vitreous volume has been 16 µl on the average. According to Quigley's theory an increase of pressure behind the vitreous (*e.g.* choroidal swelling or scleral compression) increases the pressure difference between the vitreous and the posterior chamber (PC). As a consequence water exits the vitreous and enters the PC. To the best of our knowledge our data are the first direct evidence for vitreous conductivity in a living eye. This model might be used to measure the vitreous conductivity in patients at risk of PACG.
References:
1. Quigley HA *et al.* (2003) J Glaucoma 12:167 **2.** Fatt I (1977) Invest Ophthalmol Vis Sci 16:565 **3.** Epstein DL *et al.* (1979) Am J Ophthalmol 88:1078 **4.** Drexler W *et al.* (1997): Invest Ophthalmol Vis Sci 38:1304

P024 TRANSPUPILLARY THERMOTHERAPY (TTT) INDUCES SMALL HEAT SHOCK PROTEIN (HSP 27) AND HSP 70 IN THE OPTIC NERVE HEAD

S.H. Kang[1], J.M. Kim[2], K.H. Park[3], Y.J. Kim[1], D.M. Kim[3]
[1]Seoul National University Hospital, Seoul, South-Korea, [2]Kangbuk Samsung Hospital, Seoul, South-Korea, [3]Seoul National University, Seoul, South-Korea

Purpose: To investigate the induction of heat shock proteins (Hsp 27 and 70) and quantify the amount of induction in the optic nerve head after transpupillary thermotherapy (TTT).
Design: Experimental study
Participants: Fifty Norway brown rats
Methods: TTT was performed on the right eye of Norway brown rats using an 810-nm diode laser (Iridex Co., CA, USA) installed on a slit lamp. The laser was aimed at the center of optic nerve head with 50 um spot size. The various exposure powers (range; 20 - 200mW) were used for the same exposure duration, 60 seconds. And the various exposure durations (range; 1 minute - 5 minutes) were used for the same exposure power, 100mW. Left eyes were served as controls. Twenty hours after laser irradiation, immunohistochemical staining and western blot analyses were performed.
Results: In control eyes, Hsp 70 was detected little in the optic nerve tissue by immunohistochemistry. After TTT, Hsp 70 was stained distinctly. In contrast, Hsp 27 was detected in control eyes which increased after TTT especially at the laminar cribrosa area. In the western blottings, Hsp 27 and 70 were both detected in control eyes. After TTT, the amount of Hsp 70 increased as the laser power increased. The increase of Hsp 27 after TTT was twice as much as that of Hsp 70.
Conclusions: Transpupillary laser irradiation on the optic nerve head induces expression of Hsp 27 and Hsp 70. This result can be applied to future neuroprotective experiments for glaucoma by enhancement of natural cytoprotective stress response.
References:
1. Park KH, Cozier F, Ong OC, Caprioli J. Induction of heat shock protein 72 protects retinal ganglion cells in a rat glaucoma model. Invest Ophthalmol Vis Sci 2001;42:1522–1530. **2.** Reichel E, Berrocal AM, Ip M, Kroll AJ, Desai V, Duker JS, Puliafito CA. Transpupillary thermotherapy of occult subfoveal choroidal neovascularization in patients with age related macular degeneration. Ophthalmology 1999;106:1908–1914. **3.** Desmettre T, Maurage CA, Mordon S. Transpupillary Thermotherapy (TTT) With Short Duration Laser Exposures Induce Heat Shock Protein (HSP) Hyperexpression on Choroidoretinal Layers. Laser in Surgery and Medicine 2003;33:102-107. **4.** Robertson DM, Salomao DR. The effect of transpupillary thermotherapy on the human-macula. Arch Ophthalmol 2002; 120:652–656. **5.** Desmettre T, Maurage CA, Mordon S. Heat shock protein hyperexpression on chorioretinal layers after transpupillary thermotherapy. Invest Ophthalmol Vis Sci 2001;42:2976–2980.

P025 ENDOTHELIN-ANTAGONISM: EFFECTS OF PROSTAGLANDIN F2ALPHA ON TRABECULAR MESHWORK FUNCTION

H. Thieme[1], R. Rosenthal[1], L. Choritz[2], C. Schimmat[2], M.H. Foerster[1]
[1]Augenklinik und Hochschulambulanz, Berlin, Germany, [2]Klinische Physiologie, Charité, Berlin, Germany

Introduction: Prostaglandin F2alpha (PGF2alpha) has been shown to reduce intraocular pressure (IOP) by enhancement of uveoscleral flow[1]. The trabecular meshwork (TM) is actively involved in the regulation of IOP via contractile mechanisms[2]. Contractility of TM is induced by endothelin-1 (ET-1)[3] which is probably involved in the pathogenesis of glaucoma[4]. A possible intervention of PGF2alpha in the ET-1 effects on TM function was investigated.
Aim of the study: This study was performed to analyze the mechanisms behind the additional ocular hypotensive effect of PGF2alpha.
Methods: Measurements of isometric tension were performed using a force length transducer[5]. Isolated bovine TM strips were exposed to carbachol, ET-1, and ET-1 in combination with $PGF_{2}\alpha$. Furthermore, effects of PGF2alpha on the ET-1-induced elevation of intracellular Ca2+ ([Ca2+]i) in TM cells were investigated using the Ca2+-sensitive dye fura-2AM.
Results: Contractility experiments: ET-1 (10-8 M) induced contraction of TM (69.2 ± 10.5 %, n=7 vs 100 % carbachol (10-6 M), n=6). In the presence of PGF2alpha (10-6 M) this contraction was reduced to 33.5 ± 14.3 % (n=5). PGF2alpha has no effect on the carbachol-induced contraction. When PGF2alpha was applied in the presence of the FP-receptor antagonists PGF2alpha dimethylamine (10-6 M) or PGF2alpha dimethylamide (10-6 M) the ET-1-induced contraction was not affected.
[Ca2+]i measurements: In BTM cells the baseline Ca2+ concentration was 76.8 ± 11.8 nM (n=16). PGF2alpha (10-6 M) has no effect on [Ca2+]i. Application of ET-1 (10-8 M) caused an elevation of [Ca2+]i to 203.8 ± 23.3 % of the baseline level (n=4). In the presence of PGF2alpha (10-6 M) the ET-1-induced enhancement of [Ca2+]i was significantly decreased to 146.9 ± 8.9 % (n=5). Similar results were obtained with human TM cells.
Conclusions: PGF2alpha inhibits the ET-1 induced contraction of TM. The effect of PGF2alpha is mediated via the FP receptor, since PGF2alpha failed to inhibit the ET-1-induced contraction in the presence of FP receptor antagonists. The inhibiting action of PGF2alpha might be attributed to a reduction of the intracellular Ca2+ release caused by ET-1. This study suggests that the ocular hypotensive effects of PGF2alpha could be partially attributed to its antagonistic action on the ET-1 effect on TM function.
References:
1. Linden C, Alm A, Prostaglandin analogues in the treatment of glaucoma, Drugs Aging 1999; 14:387-98. **2.** Wiederholt M, Thieme H, Stumpff F, The regulation of trabecular meshwork and ciliary muscle contractility, Progress in Retinal and Eye Research 2000;19:271-95. **3.** Lepple-Wienhues A, Stahl F, Willner U, Schafer R, Wiederholt M, Endothelin-evoked contractions in bovine ciliary muscle and trabecular meshwork: interaction with calcium, nifedipine and nickel, Curr Eye Res 1991;10:983-9. **4.** Yorio T, Krishnamoorthy R, Prasanna G, Endothelin: is it a contributor to glaucoma pathophysiology?, J Glaucoma 2002;11:259-70. **5.** Thieme H, Stumpff F, Ottlecz A, Percicot C L, Lambrou G N, Wiederholt M, Mechanisms of action of unoprostone on trabecular meshwork contractility, Investigative Ophthalmology and Visual Science 2001; 42:3193-201.
CR: none

P026 EFFECT OF PROSTAGLANDIN ANALOGUES ON IOP IN PROSTANOID EP1, EP2, AND EP3 RECEPTOR DEFICIENT MICE

M. Aihara[1], T. Ota[1], S. Narumiya[2], M. Araie[1]
[1]University of Tokyo, Tokyo, Japan, [2]University of Kyoto, Kyoto, Japan

Introduction: Prostaglandin analogues (PG-analogues) have been widely used as ocular hypotensive drugs for the treatment of glaucoma and ocular hypertension, both because of a greater effect on IOP, and considerably fewer systemic side effects than beta-blockers. Currently, four different types of PG-analogues: isopropyl unoprostone, latanoprost, travoprost, and bimatoprost, are used for the treatment of glaucoma. Recently, a new PG-analogue, tafluprost, has been developed. The intraocular metabolites of these PG-analogues with the exception of unoprostone, show a high affinity for the prostanoid FP receptor (FP). Selective FP agonists, have been thought to bind to FP, leading to IOP reduction by causing an increase in uveoscleral outflow. The molecular mechanisms of the ocular hypotensive effects of bimatoprost or unoprostone, however, have not been fully clarified. Moreover, the contribution of other prostanoid receptors to ocular hypotensive effect is still unknown.
Aim of the study: To clarify whether prostanoid EP1, EP2, and EP3 receptors are concerned with the mechanism of IOP and IOP-lowering effect of PG-analogues.
Methods: EP1 receptor deficient (EP1-/-), EP2 receptor deficient (EP2-/-), EP3 receptor deficient (EP3-/-) and wild type (EP1+/+, EP2+/+, and EP3+/+) mice aged more than eight weeks were used. Animals were acclimatized under the 12-hour light-dark cycle (6:00 on 18:00 off) for at least two weeks before experiments. IOP was measured by a microneedle method. Three micro liters of 0.005% latanoprost (LAT), 0.004% travoprost (TRA), 0.03% bimatoprost (BIM), 0.12% unoprostone (UNO) or 0.0015% tafluprost (TAF) were topically applied once into one of two eyes in a blind manner at 18:00. The fellow eye was served as non-treated control. The IOP-lowering effect of each drug three hours after the administration was calculated as the difference in IOP and reduction in IOP from the IOP of the not treated fellow eye.
Results: The baseline IOP of EP1-/-, EP2-/-, EP3-/-, EP1+/+ EP2+/+, and EP3+/+ mouse were not significantly different among genotypes. The baseline IOP was higher in night time than in daytime, and the IOP-lowering effect of LAT was greater in night time than daytime. Three hours after the administration, IOP reduction by LAT, TRA, BIM, UNO, and TAF were 18.6±1.6 (MEAN ±SEM), 25.8±1.7, 18.1±1.6, 11.3±1.5 and 26.3±0.8% (N=10 or 11) in EP1-/- mice, 20.3±1.4, 25.2±1.8, 17.9±1.9, 14.9±2.0 and 24.2±1.4% (N=10 or 11) in EP2-/- mice, 15.0±1.9, 15.4±1.5, 13.1±2.1, 11.7±1.3 and 17.4±1.8% (N=11 or 12) in EP3-/- mice, 22.3±1.4, 25.8±2.0, 19.5±2.1, 12.7±2.4 and 25.5±4.3% (N=5-7) in EP1+/+ mice, 20.6±1.6, 25.7±1.4, 18.2±1.5, 12.3±1.6 and 25.3±1.2% (N=6-7) in EP2+/+ mice, and 23.2±1.1, 26.1±1.2, 19.8±1.5, 13.7±1.8 and 25.8±2.6% (N=8-11) in EP3+/+ mice, respectively. There was no significant difference in IOP-lowering effect between EP1+/+ and EP1-/-, EP2+/+ and EP2-/- mice treated with each drug. On the other hand, in EP3-/- mice, the IOP-lowering effects of PGs, except for UNO were found to be weak ($P<0.05$).
Conclusion: EP1 and EP2 receptor may not play a role in IOP-lowering effect of LAT, TRA, BIM, UNO, and TAF, whereas EP3 receptor may play a role in IOP-lowering effect of LAT, TRA, BIM and TAF.

P027 CORNEAL NOS-2 EXPRESSION IN SECONDARY GLAUCOMA INDUCED BY UVEITIS

I. Yücel, M. Aslan, A. Ciftcioglu, Y. Akar, G. Yücel
Akdeniz University Medical School, Antalya, Turkey

Purpose: Nitric oxide is an important mediator of homeostatic processes in the eye, such as regulation of aqueous humor dynamics, retinal neurotransmission and phototransduction[1-3]. Increased expression of inducible nitric oxide synthase (NOS-2) in inflammatory diseases like uveitis suggests that it contributes to the observed pathological state[4]. The aim of this study was to evaluate the expression of NOS-2 and determine the role of reactive nitrogen metabolites in a rat model of uveitis.
Design: Uveitic glaucoma was induced via a single injection of intravitreal LPS as previously described[5]. ***Participants***: 12 male Wistar rats were included in the study.
Methods: Vitreus nitrate/nitrite levels, corneal NOS-2 expression and nitrotyrosine formation were evaluated in rats with experimental uveitis (n=6) and controls (n=6).
Main outcome measures: Expression of NOS-2 and nitrotyrosine formation were evaluated via immunohistochemistry and western blot analysis. Total nitrate/nitrite levels in the vitreous were measured by spectral analysis via the Griess reagent.
Results: Western blot analysis of the vitreous showed nitrated proteins in rats with uveitis. Similarly, immunohistochemical staining of the cornea revealed increased NOS-2 and nitrated protein immunoreactivity in uveitic rats. Spectrophotometric measurement of total nitrate/nitrite levels in the vitreous affirmed significantly increased levels of nitric oxide generation in uveitis (126 ± 2.63 µM/mg protein) *vs.* controls (65 ± 6.57µM/mg protein).
Conclusions: The presented data confirms increased NOS-2 expression in uveitic rat models and suggests that extensive formation of protein nitration and reactive nitrogen species exacerbates disease progression. Hence, selective inhibiton of NOS-2 may prevent long-term complications and lead to improvement in the management of uveitis.
References:
1. Haefliger IO, Dettmann E, Liu R, Meyer P, Prunte C, Messerli J, Flammer J. Potential role of nitric oxide and endothelin in the pathogenesis of glaucoma. Surv Ophthalmol 1999;43 Suppl 1:S51-8. **2.** Liu B, Neufeld AH Expression of nitric oxide synthase-2 (NOS-2) in reactive astrocytes of the human glaucomatous optic nerve head. Glia 2000;30:178-86. **3.** Halpern DL, Grosskreutz CL. Glaucomatous optic neuropathy: mechanisms of disease. Ophthalmol Clin North Am 2002; 15:61-8. **4.** Goureau O, Bellot J, Thillaye B, Courtois Y, de Kozak Y. Increased nitric oxide production in endotoxin-induced uveitis. Reduction of uveitis by an inhibitor of nitric oxide synthase. J Immunol 1995;154:6518-23. **5.** Mermoud A, Baerveldt G, Mickler DS, Wu GS, Rao NA. Animal model for uveitic glaucoma. Graefes Arch Clin Exp Ophthalmol 1994;232:553-60.

P028 INHIBITING EFFECT OF TISSUE TRANSGLUTAMINASE(TTG) ANTISENSE OLIGODEOXYNUCLEOTIDES ON TTG EXPRESSION IN CULTURED BOVINE TRABECULAR MESHWORK CELLS

H. Yizhen
Union Hospital of Tongji Medical College, Wuhan, China

Objective: To study the effect of tTG fully phosphorothioated antisense oligodeoxynucleotides (tTG-ASDON) on tTG expression in cultured bovine trabecular meshwork cells (BTMC) *in vitro*.
Methods: According to the secondary structure of tTG, the ASDON1 and ASDON2 complementary to the protein codogram region of tTG were designed, synthesized and phosphorothioated. The ASDON1 and ASDON2 were embedded in Lipofectamine and transfected into BTMC. The untreated group is negative control. The expression of tTG in the mRNA and protein level was measured by semi-quantitative RT-PCR and immunohistochemical technique-Supervision method respectively.
Results: Both the mRNA and the protein of tTG with tTG-ASDON1 and tTG-ASDON2 were significantly decreased compared with that of the controls ($P<0.05$). Whereas there is no significantly difference between the group of ASDON1 and the group of ASDON2.
Conclusion: The expression of tTG mRNA and protein in cultured BTMC are down-regulated by tTG- ASDON.

P029 GLC1G: A SEVENTH LOCUS FOR PRIMARY OPEN ANGLE GLAUCOMA IS FOUND ON CHROMOSOME 5

J.R. Samples, R.L. Sykes, J. Man, K. Rust, P.L. Kramer, M.K. Wirtz
Oregon Health and Sciences University, Portland, OR, United States of America

Introduction: Six loci and two genes have been mapped for Primary Open Angle Glaucoma (POAG). Two of these (GLC1C and GLC1F) were initially described in one glaucoma practice in Portland, Oregon.
Aim: We now describe the third genetic locus for open angle glaucoma (GLC1G) to be found in the same practice, giving us the advantage of being able to compare and contrast phenotypic characteristics of open angle glaucoma.
Methods: Our lab has been refining the map of chromosome 5 between 104.4 Mb to 111.2 Mb in a large Oregon family. Microsatellite markers narrowed the search to chromosome 5. Current fine mapping involves combining genotype data from microsatellite markers and sequencing data from single nucleotide polymorphisms (SNPs) located between 104.4 Mb and 111.2 Mb.
Results: We have examined 92 members of this family and obtained blood samples. There are fourteen affected members.
Conclusion: GLC1G, the seventh POAG locus has been mapped to a 3.8 Mb region on chromosome 5. Mutational analysis of candidate genes is in progress. Open angle glaucoma, from a genetic perspective, is at least seven different diseases (and likely many more) and these may be compared and contrasted in terms of their phenotypic characteristics such as corneal thickness and diurnal curve variation.
References:
1. Wirtz, M.K., Samples, J.R., Kramer, P.L., Rust, K., Topinka, J.R., Yount, J., Koler, R.D. and Acott, T.S.: Mapping a gene for adult-onset primary open angle glaucoma to chromosome 3q. Am J Human Genetics. 60(2): 272-277, (1997). **2.** Wirtz, M.K., Samples, J.R., Rust, K., Lie, J., Nordling, L., Schilz, K., Acott, T.S., Dramer, P.L.: GLCIF, A New Primary Open Angle Glaucoma Locus, Maps to 7g315-g 36. Archives of Ophthalmology. 117(2): 237-241, (1999). **3.** Wirtz, M.K., Samples, J.R.: The Genetic Loci of Open-Angle Glaucoma. Ophthalmology Clinics of North America. 16(4): 505-14, (2003) **4.** Faivre, L., Gorlin, R.J., Wirtz M.K., Godfrey, M., Dagoneau, N., Samples, J.R. LeMerrer, M., Collod-Beroud, G., Boileau, C., Munnich, A., Cormier-Daire, V.: In Frame Fibrillin-1 Gene Deletion in Autosomal Dominant Weill-Marchesani Syndrome. Journal of Medical Genetics. 40(1): 34-6, (2003). **5.** Samples, J.R., Wirtz, M.K.: Introductory Ophthalmic Genetics. Ophthalmology Clinics of North America. 16(4): 501-3, v, (2003) **6.** Samples, J.R., Kitsos, G., Economou-Petersen, E., Steinkamp, P. Sykes, R., Rust, K., Patzer, C., Grigoriadou, M., Aperis, G., Psilas, K., Petersen, M.B., Wirtz, M.K.: Refining the Primary Open-Angle Glaucoma GLC1C Region on Chromosome 3 by Haplotype Analysis. Clinical Genetics. 65(1): 40-4, (2004)

P030 TO SCREEN AND SEQUENCE OPTN GENE MUTATION IN A CHINESE FAMILY WITH PRIMARY OPEN-GLAUCOMA

Y Yuan, Y Yang, X Xiao
Harbin Medical University, Harbin, China

Objective: To investigate optineurin gene (OPTN) mutation in one family in the north of China with primary open-glaucoma (POAG) in hypertension.
Methods: Seven DNA samples from the Chinese family including four patients were amplified by polymerase chain reaction (PCR) with four pairs of primers covering four exons of OPTN gene. The mutation of PCR amplification products was evaluated by single-stranded conformation polyphism (SSCP). The positive PCR product by SSCP were cloned to vectors pUC18, the construction plasmids were identified by PCR method and double-direction sequenced.
Results: Two PCR amplification samples in the fifth exon of OPTN gene from two patients, were found abnormality by SSCP. It was found that there was ATG to AAG transition at the 98 th codon with the replacement of amino acid Met 98 Lys in one of three cloned products sequenced, but no change was found in the others.
Conclusion: The OPTN gene may be relative with the pathogenesis in Chinese patients with POAG, but it was not the key factor for the glaucoma with intraocular hypertension. The pathogenesis of POAG has difference in regions or races.

P031 GENETIC ANALYSES IN A THREE GENERATION PERUVIAN FAMILY SUGGESTS POAG IS LINKED TO GLC1F

R.A.P.G. Perez Grossmann, M.L Guevara-Fujita, C.A Murga-Zamalloa, W. Castillo-Herrera, J.E. Richards, R. Fujita
Instituto de Glaucoma y Catarata, Lima, Peru

Objective: To characterize Peruvian families affected with Primary Open Angle Glaucoma (POAG) at the molecular and genetic level, using polymorphic microsatellite markers to perform linkage analysis with markers associated to the 6 known POAG loci.
Main message: A three generation Peruvian family affected with POAG was checked with microsatellite markers of six known glaucoma regions. Microsatellites from GLC1B, GLC1C, GLC1D, GLC1E showed recombination in all markers tested. For GLC1A, some markers were recombining, while others were not very informative; however, sequencing of the three exons of gene MYOC (GLC1A) did not reveal any causative mutation. Markers from GLC1F (7q35-36) showed linkage with glaucoma in this family. This would be the second report regarding a family that segregates with this chromosomal region.
Conclusions: This three generation POAG Peruvian family segregates with microsatellite markers of chromosome 7 in the 7q35-36 region.
References:
1. Rezaie T, Child A, Hitchings R, *et al.* Adult-onset primary open-angle glaucoma caused by mutations in optineurin. Science. 2002; 295:1077-9. **2.** Stoilova D, Child A, Trifan O C, *et al.* Localization of a locus (GLC1B) for adult-onset primary open angle glaucoma to the 2cen-q13 region. Genomics 1996; 36:142-50. **3.** Trifan OC, Traboulsi EI, Stoilova D, *et al.* A Third locus (GLC1D) for adult-onsetprimary open-angle glaucoma maps to the 8q23 region. Am J Ophthalmol 1998; 126(1):17-28. **4.** Wirtz MK, Samples JR, Kramer PL, *et al.* Mapping a gene for adult-onset primary open-angle glaucoma to chromosome 3q. Am J Human Genet 1997; 60:296-304. **5.** Wirtz MK, Samples JR, Rust K, et al. GLC1F, A New Primary Open-Angle Glaucoma Locus, Maps to 7 q35-q36. Arch Ophthalmol 1999 ; 117:237-241.

P032 MYOCILIN MT1 PROMOTER POLYMORPHISM IN TURKISH PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

B. Bozkurt[1], M. Irkec[2], R.K. Ozgul[3], S. Orcan[3], B. Bulur[2], A. Ogus[3]
[1]Private Practice, Ankara, Turkey, [2]Hacettepe School of Medicine, Ankara, Turkey, [3]Molecular Biology Department, Ankara, Turkey

Introduction: The first discovered gene associated with primary open angle glaucoma (POAG) is myocilin (MYOC) at the GLC1A locus. MYOC mutations are responsible for approximately 2 to 4% of POAG cases. MYOC gene promoter variant -1000C>G (MYOC mt1), concerns a much larger proportion (15%) of the population when compared with MYOC mutations.The association of MYOC mt1 variant with POAG is still at debate as published reports showed conflicting results with each other[1-5].
Purpose: To evaluate the association of the MYOC mt1 variant with POAG and its possible role on the phenotype and the severity of disease in Turkish glaucoma patients.
Study design: Case-control study.
Methods: There were 56 females and 32 males with a mean age of 62.66 ± 10.32 (SD) years in POAG group and 67 females and 56 males with a mean age of 61.67 ± 10.12 (SD)in the control group. The magnitude of the mean deviation (MD) was used to assess the stage of glaucoma. Of the 88 POAG patients 39 had early, 26 had moderate and 23 had severe glaucoma. All subjects were genotyped by PCR-RFLP method. Allele or genotype frequencies between healthy subjects and glaucoma patients were compared by χ_2 test or Fisher exact test. The age at diagnosis and inclusion, the IOP at diagnosis and C/D ratio were compared between MYOC mt1 carriers and non-carriers using Student's *t* test and Mann Whitney U test. Statistical significance was defined as $p<0.05$.

Results: We have found that 17.1% of the controls had MYOC mt1 variant, while 27.3% of the POAG patients were MYOC mt1 carriers (p=0.107). The mean age at diagnosis and the age at inclusion were quite similar in MYOC mt1 carriers (51.6 ± 9.5 years and 61.9 ± 10.9 years, respectively) and non-carriers (53.9 ± 9.7 years and 62.9 ± 10.2 years, respectively) (p=0.31 and p=0.69, respectively). The mean IOP at diagnosis did not differ between MYOC.mt1 carriers (26.5 ± 3.7 mmHg) and non-carriers (25.3 ± 2.9 mmHg) (p=0.12). When the POAG patients were further classified according to the stage of the disease, 12 patients (30.8%) with early glaucoma, 6 patients (23%) with moderate glaucoma and 6 patients (26%) with severe glaucoma were found to be MYOC mt1 carriers (p=0.78).
Conclusion: Our results suggest that in our Turkish glaucoma patients, MYOC mt1 is unrelated to risk and severity of POAG.
References:
1. Colomb E. *et al.* Association of a single nucleotide polymorphism in the TIGR/MYOCILIN gene promoter with the severity of primary open-angle glaucoma. Clin. Genet 2001;60:220-225. **2.** Copin B. *et al.* Apolipoprotein E promoter single nucleotide polymorphisms affect the phenotype of primary open-angle glaucoma and demonstrate interaction with the myocilin gene. Am J Hum Genet 2002;70:1575-81. **3.** Polansky JR..*et al.* Associations of the myocilin mt1 promoter variant with the worsening of glaucomatous disease over time. Clin Genet 2003;64:18-27. **4.** Alward WL. *et al.* Variations in the myocilin gene in patients with open-angle glaucoma. Arch Ophthalmol 2002;120:1189-97. **5.** Fan BJ. *et al.* Polymorphisms in the myocilin promoter unrelated to risk and severity of primary open-angle glaucoma. J Glaucoma 2004;13:377-84.

P033 TUMOUR NECROSIS FACTOR ALPHA-308 AND INTERLEUKIN -10 POLYMORPHISMS IN TURKISH GLAUCOMA PATIENTS

M. Irkec, B. Bozkurt, L. Mesci, B. Bulur, M. Orhan, I. Tezcan
Hacettepe University School of Medicine, Ankara, Turkey

Introduction: Polymorphisms in cytokine genes can influence immune responses, inflammation, tissue injury and apoptosis. Tumour necrosis factor-alpha (TNFα) might regulate cell death in response to conditions that stress retinal neurons in glaucoma.
Purpose: In this study, our aim was to evaluate the associations between TNFα-308, IL-10 gene polymorphisms and glaucoma.
Study design: Case control study. The study protocol was approved by the Ethics Committee of Hacettepe University and informed consent was obtained from all participating individuals.
Methods: 219 glaucoma patients with a mean age of 64.35 ± 11.06 years and 178 healthy subjects with a mean age of 61.95 ± 10.61 years were enrolled in the study. Single-nucleotide polymorphisms in the genes for TNFα (-308) and IL-10 (-1082, -819, -592) were analyzed by using PCR-restriction fragment length polymorphism (PCR-RFLP) method. Allele or genotype frequencies between controls and glaucoma patients were compared by χ_2 test or Fisher's exact χ_2 test. Statistical significance was defined as p<0.05.
Results: The frequencies of genotypes for TNFα -308 among healthy subjects were 167 (93.8%) for GG, 9 (5.1%) for GA and 2 (1.1%) for AA, while in the glaucoma group 141 patients (64.4%) were GG, 74 (33.8%) were GA and 4 (1.8%) were AA. The difference in GA distribution among the groups was statistically significant (p<0.001). IL-10 haplotypes (arranged as genotypes) ACC/ACC (61 patients; 28.4%) and ACC/ATA (51 patients; 23.7%), associated with low IL-10 production, were significantly higher in the glaucoma group compared to the healthy subjects (18 patients; 10.7% and 30 patients 17.8%, respectively)(p<0.001). No correlation was found between IL-10 polymorphism and severity of glaucoma (p=0.081).
Conclusion: TNFα is shown to be secreted from activated glial cells in glaucomatous optic nerve head and seems to play an important role in the degeneration of retinal ganglion cells in glaucoma[1-4]. TNFα -308 polymorphism (AA and GA genotypes) is associated with higher TNFα production. Similar to our findings, in the study of Lin *et al* [5], allele A of TNFα-308 polymorphism occurred more frequently in Chinese patients with POAG. Genetic predisposition leading to an abnormal immune response might play role in glaucoma susceptibility and severity. In the future, neuroprotection might be possible by inhibiting the action of cytokines taking role in apoptosis and inflammation.
References:
1. Wax MB, Tezel G. Neurobiology of glaucomatous optic neuropathy. Molecular Neurobiology 2002; 26: 45-55. **2.** Yuan ve Neufeld. Tumour necrosis factor- α: A potentially neurodestructive cytokine produced by glia in the human glaucomatous optic nerve head. Glia 2000; 32: 42-50. **3.** Tezel G. *et al.* TNF- α and TNF- α receptor-1 in the retina of normal and glaucomatous eyes. IOVS 2001;42:1787-94. **4.** Tezel G, Wax MB. Increased production of tumour necrosis factor- α by glial cells exposed to stimulated ischemia or elevated hydrostatic pressure induces apoptosis in cocultured retinal ganglion cells. J of Neuroscience 2000; 20: 8693-700. **5.** Lin HJ. *et al.* Association of tumour necrosis factor alpha-308 gene polymorphism with primary open-angle glaucoma in Chinese. Eye 2003; 17: 31-4.

P034 POLYMORPHISMS IN THE IL-1 GENE CLUSTER ASSOCIATED WITH REDUCED RISK FOR PRIMARY OPEN ANGLE GLAUCOMA IN AN AMERICAN WHITE POPULATION

C.Y. Wang[1], M.E. Fini[2]
[1]Taichung Veteran General Hospital, Taichung, Taiwan, [2]Bascom Palmer Eye Institute, Miami, FL, United States of America

Introduction: We reported that expression of the endothelial leukocyte-adhesion molecule (ELAM)-1 by TM cell is a diagnostic marker of glaucoma. ELAM-1 expression is controlled by activation of an IL-1 autocrine feedback loop. In our previous study, short term upregulated endogenous IL-1 was shown to protect TM cell against oxidative stress and lower IOP. *In vitro* test, IL-1α (-889 T) allele increase IL-1α protein level with respect to the IL-1α (-889C) allele; and two polymorphic IL-1β (-511T) and (+3953T) both have increased IL-1β secretion.
Aim of the study: We hypothesize that IL-1α and Il-1β variants, IL-1α (-889T), IL-1β (-511T) and IL-1β (+3953T), which result in increased secretion of IL-1α and IL-1β, would reduce the risk of primary open angle glaucoma (POAG).
Methods: We assessed genomic DNA from 100 POAG patients and 104 normal controls in Caucasian population over 40 years of age by polymerase chain reaction-based analysis. Logistic-regression methods were used to determine the potential effect of each genotype, allele and the interaction between them on the risk of POAG.
Results: We identified a single nucleotide polymorphism, IL-1β (+3953C->T), that was significantly associated with protection from POAG. Age-adjusted odds ratio (95% CI): 0.52 (0.27, 0.98) p=0.04. The allele frequency of IL-1β (+3953T) was significantly higher in normal controls than in the POAG group (28% versus 17%, p=0.01). The allele frequency of IL-1α (-889T) was higher in the normal control group than in POAG group at a borderline significance (39% versus 29%, p=0.06). There were no differences between the genotype or allele frequencies of IL-1 β (-511C/T) between the POAG and the control groups. The 'TT' haplotype of IL1β-3953 and IL1β-511 and the 'TTT' haplotype of IL1α-889, IL1β-3953 and IL1β-511 are more common in the control group with score statistics of –2.78 and –3.01 and empirical p-values of 0.006 and 0.002 respectively.
Conclusion: IL-1β (+3953T) polymorphism may be a protective marker against from POAG. There was a trend for a lower POAG risk in homozygote TT of IL-1α (-889), suggesting that with a larger sample size, this might also be a predictive marker.
References:
1. Wang, N. *et al.*, Activation of a tissue-specific stress response in the aqueous outflow pathway of the eye defines the glaucoma disease phenotype. Nat Med, 2001. 7(3): p. 304-9. **2.** Mercurio, F,Manning, AM, NF-kappaB as a primary regulator of the stress response. Oncogene, 1999. 18(45): p. 6163-71. **3.** Maier, JA. *et al.*, Extension of the life-span of human endothelial cells by an interleukin-1 alpha antisense oligomer. Science, 1990. 249(4976): p. 1570-4. **4.** Beg, AA,Baltimore, D, An essential role for NF-kappaB in preventing TNF-alpha-induced cell death. Science, 1996. 274(5288): p. 782-4. **5.** Kee, C,Seo, K, The effect of interleukin-1alpha on outflow facility in rat eyes. J Glaucoma, 1997. 6(4): p. 246-9. **6.** Nicklin, MJ *et al.*, A sequence-based map of the nine genes of the human interleukin-1 cluster. Genomics, 2002. 79(5): p. 718-25. **7.** Wiggs, JL. *et al.*, Genetic linkage of autosomal dominant juvenile glaucoma to 1q21-q31 in three affected pedigrees. Genomics, 1994. 21(2): p. 299-303. **8.** Schaid, DJ. *et al.*, Score tests for association between traits and haplotypes when linkage phase is ambiguous. Am J Hum Genet, 2002. 70(2): p. 425-34. **9.** Hosmer DW Jr, Lemeshow S, Applied logistic regression, John Wiley: 1989.

P035 TNF-A PROMOTOR POLYMORPHISMS AND PRIMARY OPEN ANGLE GLAUCOMA

G. Mossböck, M. Weger, D. Mattes, O. Schmut, W. Renner, Y. El-Shabrawi
Medical University Graz, Austria, Graz, Austria

Purpose: Primary open angle glaucoma (POAG) is a multifactorial opticopathy with a strong hereditary component[1]. Recent studies suggested an implication of tumor necrosis factor-a (TNF-a), a major immunomodulator and proinflammatory cytokine, in the pathogenesis of this disease[2,3]. Lin *et al.* identified the TNF-a -308G. A gene polymorphism as a novel risk factor in Chinese patients with POAG[4]. The purpose of the present study was to investigate a potential association between the TNF-a -308G>A and the TNF-a -238G>A gene polymorphisms[5] in a Caucasian cohort of glaucoma patients.
Design: Retrospective case-control study.
Participants and controls: The study comprised 114 unrelated, Caucasian patients with POAG and 228 healthy control subjects, matched for age and gender. All participants were seen at the Department of Ophthalmology, Medical University Graz.
Methods: Genotyping was performed by polymerase chain reaction and restriction fragment length polymorphism, for statistical analysis chi-square test was used.
Main outcome measures: TNF-a-308 and -238 genotypes.
Results: Genotype distribution of the TNF-a-308G>A and the TNF-a-238G>A gene polymorphisms were not significantly different between patients with POAG and control subjects. Frequencies of the TNF-a -308 A-allele and the TNF-a -238 A-allele did not differ significantly between both groups, either (TNF-a -308 A-allele: 15.4% *vs.* 16.0%; p=0.91 ; TNF-a -238 A-allele: 3.1% *vs.* 5.0%; p=0.32).
Conclusion: In controversy to the previously reported association between TNF-a -308G>A and POAG in Chinese patients our data suggest that none of the investigated TNF-a gene polymorphisms are major risk factors among Caucasian patients with POAG.
References:
1. Wolfs RC, Klaver CC, Ramrattan RS, van Duijn CM, Hofman A, de Jong PT. Genetic risk of primary open-angle glaucoma. Population-based familial aggregation study. Arch Ophthalmol 1998;116:1640-5 **2.** Tezel G, Li LY, Patil RV, Wax MB. TNF-alpha and TNF-alpha receptor-1 in the retina of normal and glaucomatous eyes. Invest Ophthalmol Vis Sci. 2001;42:1787-94. **3.** Tezel G, Wax MB. Increased production of tumor necrosis factor-alpha by glial cells exposed to simulated ischemia or elevated hydrostatic pressure induces apoptosis in cocultured retinal ganglion cells. J Neurosci. 2000;20:8693-700. **4.** Lin HJ, Tsai FJ, Chen WC, Shi YR, Hsu Y, Tsai SW. Association of tumour necrosis factor alpha -308 gene polymorphism with primary open-angle glaucoma in Chinese. Eye 2003;17:31-4. **5.** Allen RD. Polymorphism of the human TNF-alpha promoter – random variation or functional diversity? Mol Immunol 1999;36:1017-27.

P036 THE APOLIPOPROTEIN E GENE POLYMORPHISM IS ASSOCIATED WITH OPEN ANGLE GLAUCOMA IN THE JAPANESE POPULATION

F. Mabuchi, S. Tang, D. Ando, M. Yamakita, J. Wang, K. Kashiwagi, Z. Yamagata, H. Iijima, S. Tsukahara
University of Yamanashi, Yamanashi, Japan

Introduction: The association between apolipoprotein E (APOE) allele and open angle glaucoma (OAG) is controversial with previous reports showing positive results[1,2] and others showing negative ones.[3,4] Additionally, the previous studies on the APOE allele and OAG have been performed in the white population, and there have been no studies in other populations.
Objective: To assess whether genetic polymorphisms of the APOE gene are associated with OAG in the Japanese population.
Methods: Genomic DNA was examined from a cohort of 310 Japanese patients with OAG and 179 control subjects. The average age was 63.5 ± 14.4 years (mean ± SD) for the OAG patients and 65.5 ± 11.6 years for the control subjects. The presence or absence of the diseases in all patients and controls was based on clinical examination and/or ophthalmic records. The APOE allele frequency (epsilon2, epsilon3, and epsilon4 alleles) was studied by restriction fragment length polymorphism analysis, and compared between OAG patients and control subjects. The association between the intraocular pressure (IOP) and the APOE alleles was evaluated.
Results: There was a significant difference in the APOE genotype frequencies between these groups (P = 0.0006 Chi-square test). The frequencies of the epsilon2 and epsilon4 alleles were significantly lower in the OAG patients compared to the control subjects (2.6% *vs.* 5.0%, P = 0.048 and 6.0% *vs.* 10.6%, P = 0.012 respectively, Fisher exact test). The frequency of the epsilon3 allele was significantly higher in the OAG patients compared to the control subjects (91.4% vs. 84.4%, P = 0.0010, Fisher exact test). Adjusted for age, gender, and IOP, an appropriate threefold reduction in OAG risk (P = 0.018, odds ratio [OR] 0.29, 95% confidence interval [CI] 0.10 to 0.80) was found with the epsilon2 allele and a twofold increased risk of OAG (P = 0.033, OR 1.97, 95% CI 1.06 to 3.67) was found with the epsilon3 allele. The maximum IOP (18.3 ± 6.0 mmHg) in patients with the epsilon4 allele was significantly lower than that (21.3 ± 9.1 mmHg) in patients without the epsilon4 allele (P = 0.006, student t-test).
Conclusion: The APOE gene polymorphism is associated with OAG in the Japanese population. Further studies in the other ethnic populations should be performed to elucidate the relationship between APOE and OAG.
References:
1. Vickers JC, Craig JE, Stankovich J, McCormack GH, West AK, Dickinson JL, *et al.* The apolipoprotein epsilon4 gene is associated with elevated risk of normal tension glaucoma. Mol Vis 2002;8:389-93. **2.** Junemann A, Wakili N, Mardin C, Naumann GO, Bleich S, Henkel K, *et al.* Prospective case control study on genetic assocation of apolipoprotein epsilon2 with intraocular pressure. Br J Ophthalmol 2004;88(4):581-2. **3.** Ressiniotis T, Griffiths PG, Birch M, Keers S, Chinnery PF. The role of apolipoprotein E gene polymorphisms in primary open-angle glaucoma. Arch Ophthalmol 2004;122(2):258-61. **4.** Lake S, Liverani E, Desai M, Casson R, James B, Clark A, *et al.* Normal tension glaucoma is not associated with the common apolipoprotein E gene polymorphisms. Br J Ophthalmol 2004;88(4):491-3.

P037 EFFECT OF VARIOUS STEROIDS ON THE EXPRESSION OF MYOCILIN AND THE MORPHOLOGY OF TRABECULAR MESHWORK CELLS

C. Kee, S.C. Park, M.K. Joe
Samsung Medical Center/Sungkyunkwan Univ, Seoul, South-Korea

Purpose: Steroid is known to increase the intraocular pressure (IOP) and can produce steroid-induced glaucoma. Myocilin, which is inducted by steroid, is related with elevating the IOP. Steroid

can change the morphology of trabecular meshwork (TM) cells. This study was conducted to investigate the effect of various steroids on the expression of myocilin and the morphologic changes of TM cells, to verify why some steroids develop steroid-induced glaucoma more frequently than other steroids.
Design: Experimental study.
Participants and /or controls: Four different types of steroids were used.
Methods: Myocilin inductions by various steroids (fluorometholone, dexamethasone, prednisolone, rimexolone) were analyzed by Northern blot analyses in human TM cells. Morphologic changes with special staining for actin and tubulin filaments of TM cells were also assessed by contrast microscope.
Main outcome measures: Fluorometholone induced the least myocilin expression.
Results: Myocilin induction by various steroids showed that fluorometholone exhibited the weakest expression. By microscopy, steroid-treated TM cells showed more elongation and had more processes than untreated cells. However, the morphologic changes and special staining patterns of TM cells treated with various steroids were similar.
Conclusions: The difference of potential in elevating the IOP induced by various steroids may be caused by the amount of expression of myocilin by each steroid.
References:
1. Armaly MF. The heritable nature of dexamethasone induced ocular hypertension. Arch Ophthalmol. 1966; 75: 32. **2.** Mindel JS, Trivitia HO, Smith H Jr, Walker EC. Comparative ocular pressure elevation by medrysone, fluorometholone and dexamethasone phosphate. Arch Ophthalmol. 1980; 98: 1577. **3.** Stone EM, Fingert JH, Alward WLM, Nguyen TD, Polansky FR, Sunden SLF, Nishimura D, Clark AF, Nystuen A, Nicholas BE, Mackey DA, Ritch R, Kalenak JW, Craven ER, Sheffield VC. Identification of a gene that causes primary open-angel glaucoma. Science. 1997; 275: 668. **4.** Fautsch MP, Bahler CK, Jewison DJ, Johnson DH. Recombinant TIGR/MYOC increases outflow resistance in the human anterior segment. Invest Ophthalmol Vis Sci. 2000; 41: 4163. **5.** Clark AF, Wilson K, McCartney MD, Miggans ST, Kunkle M, Howe W. Glucocorticoid-induced formation of cross-linked actin networks in cultured hyman trabecular meshwork cells. Invest Ophthalmol Vis Sci. 1994; 35: 281.

P038 ANALYSIS OF MESSENGER RNA EXPRESSION OF BONE MORPHOGENETIC PROTEINS, THEIR RECEPTORS AND ACTIVINS IN CONJUNCTIVA AND TENON'S CAPSULE FIBROBLASTS IN SITU AND IN VITRO
K. Andreev[1], M. Zenkel[2], A. Jünemann[2], U. Schlötzer-Schrehardt[2], F. Kruse[2]
[1]Vision Eye Center, Sofia, Bulgaria, [2]Friedrich-Alexander University, Erlangen, Germany

Introduction: The major determinant of the long-term outcome of glaucoma filtering surgery is the postoperative conjunctival wound-healing and scaring response which is mainly mediated by Tenon's capsule fibroblasts. Members of the transforming growth factors (TGF)-β superfamily are multifunctional cytokines which are involved in the wound healing cascade and probably affect scarring after glaucoma filtration surgery. This superfamily can be divided into two main branches: the TGF-β/activin and bone morphogenetic protein (BMP)/growth and differentiation factor (GDF) groups.
Purpose: The aim of the study was to investigate messenger RNA expression of various BMP, their receptors, and activins in human Tenon's capsule fibroblasts *in situ* and *in vitro* order to determine their putative role in wound healing after glaucoma filtering surgery.
Design: Experimental laboratory investigation.
Methods: Tenon's capsule specimens obtained from 13 patients with glaucoma (mean age 70.4 ± 10.1 years, range 44 to 86), one with scared filtering bleb (72 years) and 17 with cataract (mean age 69.3 ± 4.6 years, range 66-74) during extracapsular cataract extraction or trabeculectomy were used for *in situ* RNA extraction or fibroblast cultures establishment. Messenger RNA expression of bone morphogenetic proteins (BMP)-2, BMP-3, BMP-4, BMP-5, BMP-6, BMP-7, their receptors (BMPR) types I (BMPR IA, BMPR IB) and II (BMPR II), as well as activins A and B was investigated by semi-quantitative RT-PCR in biopsy specimens and in cultured Tenon's capsule fibroblasts.
Results: Expression of mRNA and protein of BMP-2, BMP-3, BMP-4, BMP-6, Activin A and all investigated receptors was detected *in situ* and in cultured Tenon's capsule fibroblasts. Comparison of mRNA data of cultures established from cataract, primary open-angle glaucoma and pseudoexfoliation glaucoma patients, as well as from scared filtering bleb, revealed no significant difference in expression and location for BMPs, their receptors, and activins. *In situ*, a weak expression of BMP-7 mRNA in addition to expressed *in vitro* mRNAs was observed. Semi-quantitative data analysis showed stronger expression of BMP-4 *in situ* and *in vitro*, compared to other investigated growth factors.
Conclusions: Our data suggest that in addition to TGF-β1 and TGF-β2, a variety of growth factors belonging to the different branches of the TGF-β superfamily are transcribed in Tenon's fibroblasts *in situ* and *in vitro*, derived from patients with glaucoma, as well as of healthy subjects. Given the importance of the TGF-β superfamily during embryonic development, the results suggest that its members may also be components of the conjunctival cytokine meshwork and may participate in the regulation of cellular proliferation and differentiation. It furthers appears that BMPs and activin A, may play a role in conjunctival wound healing process and may influence the results of glaucoma filtering surgery.
References:
1. Kaiser S, Schirmacher P, Philipp A, Protschka M, Moll I, Nicol K, Blessing M. Induction of Bone morphogenetic protein-6 in skin wounds. Delayed reepitelisation and scar formation in BMP-6 over expressing transgenic mice. J Invest Dermatol 1998; 111: 1145-1152. **2.** Khaw P, Chang L, Wong T, Mead A, Daniels J, Cordeiro F. Modulation of wound healing after glaucoma surgery. Curr Opin Ophthalmol 2001; 12: 143-148. **3.** Massagué J. The transforming growth factor-β family. Ann Rev Cell Biol 1990; 6: 597-641. **4.** Munz B, Smola H, Engelhardt F, Bleuel K, Brauchle M, Lein I, Evans L, Huylebroeck D, Balling R, Werner S. Overexpression of activin A in the skin of transgenic mice reveals new activities of activin in epidermal morphogenesis, dermal fibrosis and wound repair. EMBO J 1999; 18: 5205-5215. **5.** O'Kane S, Ferguson M. Transforming Growth Factor-βs and wound healing. Int J Biochem Cell Biol 1997; 29: 63-78. **6.** Reddi AH. Bone morphogenetic proteins: an unconventional approach to isolation of first mammalian morphogenes. Cytokine Growth Factor Rev 1997; 8: 11-20. **7.** Shepard P, Grünewald M, Hafner M, Krieg T, Smola H. Bone morphogenetic proteins in skin wound healing. J Invest Dermatol 2000; 115: 561-569. **8.** Stelnicki E, Longaker M, Holmes D, Vandrewall K, Harrison M, Largman C, Hoffman W. Bone morphogenetic protein-2 induces scar formation and skin maturation in the second trimester fetus. Plast Reconstr Surg 1998; 101: 12-19. **9.** You L, Kruze F, Pohl J, Völker H. Bone Morphogenetic Proteins and Growth and Differentiation Factors in the Human Cornea. IOVS 1999; 40: 296-311. **10.** You L, Kruze F. Differential effect of activin A and BMP-7 on myofibroblast differentiation and the role of the Smad signaling pathway. IOVS 2002; 43: 72-81

P039 REDUCED PROTEIN EXPRESSION OF MATRIX METALLOPROTEINASES BY CULTURED SUBCONJUNCTIVAL FIBROBLASTS FROM PRIMARY OPEN ANGLE GLAUCOMA
C. Liu[1], Y. Huang[2], W. Chen[1], Y. Wong[2]
[1]Taipei Veterans General Hospital, Taipei, Taiwan, [2]Chi-Mei Medical Center, Tainan, Taiwan

Objective: To compare the production of matrix metalloproteinase (MMP)-1, -2, -3, and tissue inhibitor of MMP (TIMP)-1 by cultured conjunctival fibroblasts derived from patients of primary open angle glaucoma on topical glaucoma medications and non-glaucoma controls.
Design: Prospective, cross-sectional laboratory experiments
Participants and controls: Glaucoma patients undergoing trabeculectomy in whom medication therapy has failed to control the intraocular pressure and non-glaucoma controls undergoing surgery for cataract or simple rhegmatogenous retinal detachment
Intervention: Ocular surgery includes trabeculectomy, cataract extraction or scleral buckling procedure. Subconjunctival connective tissue obtained intraoperatively was processed for cell culture. Enzyme linked immunosorbent assay (ELISA) of the conditioned medium was performed after the cells had been cultured for 24 hours with or without the addition of stimulant agents, which includes phorbol myristate acetate (PMA) and serial concentrations (from 10-9 M to 10-12 M) of transforming growth factor (TGF) β^2.
Main outcome measures: Protein levels of MMP-1, -2, -3, and TIMP-1 in the conditioned medium as determined by ELISA.
Results: At baseline, the glaucoma group (n=10) had lower protein levels of MMP 1 (17.97 ± 29.03 *vs* 48.27 ± 30.76 ng/ml), MMP 2 (203.80 ± 116.21 *vs* 328.95 ± 148.23 ng/ml), MMP 3 (64.28 ± 57.86 *vs* 1681.77 ± 2204.13 ng/ml), and TIMP 1 (109.36 ± 56.20 *vs* 199.45 ± 149.49 ng/ml) than the control group (n=5), but the difference did not reach statistical significance (Mann-Whitney test, P=0.125, P=0.142, P=0.066, and P=0.462, respectively). In both glaucoma and the control groups, MMP 1 expression was up-regulated with the addition of PMA (Wilcoxon Signed Ranks Test, P=0.007, P=0.043, respectively) or TGF beta2 10-10M (P=0.015, P= 0043, respectively) in the culture medium. The protein level of each studied molecules did not differ significantly among cells cultured with various concentrations of TGF beta2. With PMA, the MMP 2 (214.74 ± 93.58 *vs* 382.95 ± 118.45 ng/ml, P=0.02) and MMP 3 levels (67.85 ± 53.79 *vs* 1817.29 ± 2347.09 ng/ml, P=0.027) remained lower in glaucoma. With TGF beta2 10-10M, MMP 2 (203.25 ± 101.12 vs. 403.99 ± 113.13 ng/ml, P=0.01) and MMP 3 (58.26 ± 58.99 vs1354.68 ± 1764.64 ng/ml, P=0.037) also remained lower in glaucoma than in the controls.
Conclusions: Since MMP in involved in the postoperative wound healing process of glaucoma filtering surgery, the decreased protein expression of MMP 2 and MMP 3 by subconjunctival fibroblasts of glaucoma patients in the presence of external stimulants implicates that it may be associated with increased surgical failure of filtering surgery in patients with a history of long term topical glaucoma medications.
References:
1. Wong TT, Mead AL, Khaw PT. Matrix metalloproteinase inhibitor modulates postoperative scarring after experimental glaucoma filtration surgery. Invest Ophthalmol Vis Sci 2003;44:1097-1103. **2.** Mamiya K, Ohguro H, Ohguro I, *et al.* Effects of matrix metalloproteinase-3 gene transfer by electroporation in glaucoma filter surgery. Exp Eye Res 2004;79:405-10. **3.** Liu CJ, Huang YL, Chiu AW, Ju CF. The transcripts expression of matrix metalloproteinases in the conjunctiva following glaucoma filtration surgery in rabbits. Ophthalmic Res 2004;36:114-119 **4.** Liu CJ, Huang YL, Ju JP. *et al.* Altered transcripts expression of matrix metalloproteinases and their tissue inhibitors in Tenon's capsule of patients with glaucoma. J Glaucoma 2004; 13:486-91. **5.** Stamenkovic I. Extracellular matrix remodelling: the role of matrix emtalloproteinases. J Pathology 2003;200:448-64.

P040 EFFECT OF HYPOXIA ON THE SURVIVAL AND PRODUCTION OF NITRIC OXIDE IN TRABECULAR MESHWORK CELLS
J.W. Kim
Catholic University of Daegu, Daegu, South-Korea

Purpose: To investigate the effect of hypoxia on the survival and nitric oxide (NO) production of cultured trabecular meshwork (TM) cells.
Methods: After inducing chemical hypoxia with sodium cyanide, the survival and nitrite production of the primarily cultured porcine TM cells were assessed with MTT and Griess assays. The effect of NOS inhibitor, Nw-Nitro-L-arginine methyl ester (L-NAME), was also assessed. Flow cytometry using annexin/PI was done to evaluate apoptosis.
Results: Chemical hypoxia decreased TM cell survival significantly ($p<0.05$) with increased NO production. This hypoxia-induced antiproliferative effect was abolished by L-NAME ($p<0.05$). Flow cytometric analysis revealed that hypoxia induced apoptosis of TM cells, which was inhibited by L-NAME.
Conclusions: Hypoxia decreases the survival of TM cells and induced apoptosis, accompanied by increased NO production. The hypoxia-induced decreased survival of TM cells may be mediated by NO.
References:
1. Kim JW, Heo H, Lee HW. Effect of nitric oxide on the proliferation of cultured porcine trabecular meshwork cells. Korean J Ophthalmol 2003;17:1-6. **2.** Moncada S, Palmer RMJ, Higgs EA. Nitric oxide: physiology, pathophysiology, and pharmacology. Pharmacol Rev 1991;43:109-42. **3.** Bredt DS, Snyder SH. Nitric oxide: a physiologic messenger molecule. Annu Rev Biochem 1994;63:175-95. **4.** Brüne B, Knethen A, Sandau KB. Nitric oxide and its role in apoptosis. Eur J Pharmacol 1998;351:261-72. **5.** Beck K-F, Eberhardt W, Frank S. *et al.* Inducible NO synthase: Role in cell signalling. J Exp Biol 1999;202:645-53. **6.** Gunasekar PG, Borowiz JL, Isom GE. Cyanide-induced generation of oxidative species: Involvement of nitric oxide synthase and cyclooxygenase-2. J Pharmacol Exp Ther 1998;285:236-41. **7.** Green LC, Wagner DA, Glogoski J. *et al.* Analysis of nitrate, nitrite and [15N]nitrate in biologic fluids. Anal Biochem 1982;126:131-8. **8.** Polansky JR, Weinreb RN, Baxter JD, Alvarado J. Human trabecular cells. I. Establishment in tissue culture and growth characteristics. Invest Ophthalmol Vis Sci 1979;18:1043-9. **9.** Alvarado JA, Wood I, Polansky JR. Human trabecular cells. II. Growth pattern and ultrastructural characteristics. Invest Ophthalmol Vis Sci 1982;23:464-78. **10.** Kawa LE, Higginbotham EJ, Chang, IL, Yue B. Effects of antiglaucoma medications on bovine trabecular meshwork cells *in vitro.* Exp Eye Res 1993;57:557-65. **11.** O'Brien ET, Perkins SL, Roberts BC, Epstein DL. Dexamethasone inhibits trabecular cell retraction. Exp Eye Res 1996;62:675-88. **12.** Meyer P, Champion C, Schlotzer-Schrehardt U. *et al.* Localization of nitric oxide synthase isoforms in porcine ocular tissues. Curr Eye Res 1999;18:375-80. **13.** Kitano S, Morgan J, Caprioli J. Hypoxic and excitotoxic damage to cultured rat retinal ganglion cells. Exp Eye Res 1996;63:105-12. **14.** Luo X, Lambrou GN, Sabel JA, Hicks D. Hypoglycemia induces general neuronal death, whereas hypoxia and glutamate transport blockade lead to selective retinal ganglion cell death *in vitro.* Invest Ophthalmol Vis Sci 2001;42:2695-705. **15.** Nathanson JA, McKee M. Identification of an extensive system of nitric oxide-producing cells in the ciliary muscle and outflow pathway of the human eye. Invest Ophthalmol Vis Sci 1995;36:1765-73. **16.** Nathanson JA, McKee M. Alterations of ocular nitric oxide synthase in human glaucoma. Invest Ophthalmol Vis Sci 1995; 36:1774-84. **17.** Wiederholt M, Sturm A, Lepple-Wienhues A. Relaxation of trabecular meshwork and ciliary muscle by release of nitric oxide. Invest Ophthalmol Vis Sci 1994;35:2515-20. **18.** Matsuo T. Basal nitric oxide production is enhanced by hydraulic pressure in cultured human trabecular cells. Br J Ophthalmol 2000;84:631-5. **19.** Ellis DZ, Nathanson JA, Rabe J, Sweadner KJ. Carbachol and nitric oxide inhibition of Na,K-ATPase activity in bovine ciliary processes. Invest Ophthalmol Vis Sci 2001;42:2625-31.

P041 ELEVATION OF PRIMATE IOP IS ASSOCIATED WITH A FALL IN EAAT1 BUT NOT EAAT2 EXPRESSION
W. Lu[1], C. Mitchell[1], C. Rasmussen[2], B.A. Gabelt[2], B. Hennes[2], P. Kaufman[2], A.M Laties[1]
[1]University of Pennsylvania, Pennsylvania, PA, United States of America, [2]University of Wisconsin, Madison, WI, United States of America

Purpose: To determine whether expression of the glutamate transporters EAAT1 or EAAT2 is altered in the retinas of primates with elevated intraocular pressure (IOP).
Methods: IOP was elevated unilaterally in cynomolgus monkeys by laser photocoagulation of the trabecular meshwork. IOP was monitored weekly. Oral memantine (8 mg/kg per diem) was given to 5 of 14 monkeys. 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 EAAT1 or EAAT2 and appropriate secondary antibodies and visualized with ECL. Ex-

pression was quantified from each blot using Image Pro Plus software and 4 replicates were run for each sample. For immunohistochemical studies, tissue was perfused with 2% paraformaldehyde and sectioned at 12 microns. Sections were processed for immunohistochemistry using EAAT1 and 2 antibodies and staining was quantified as above. Staining from three regions in up to 9 corresponding sections were analyzed from each eye.
Results: Expression of EAAT1 was decreased in eyes exposed to elevated IOP. Immunoblots gave the mean ratio of protein in lasered *vs* non-lasered (L/NL) eye as 0.80 ± 0.06 (n=7). To determine where this decrease was occurring, immunohistochemical analysis was undertaken. In control eyes, highest expression of EAAT1 was in the nerve fiber layer. When expression throughout the retina was quantified, the L/NL was 0.67 ± 0.05 (n=7). EAAT2 levels were not significantly altered by elevated pressure. Immunoblotting gave a mean of 0.98 ± 0.08 (n=7). Histochemical analysis showed EAAT2 was not as concentrated in the nerve fiber layer, with a cross-retinal L/NL of 1.43±0.53 (n=7). Preliminary analysis suggests that the effect of memantine was minimal.
Conclusions: These preliminary findings suggest elevated IOP does not affect expression of EAAT2 in the primate retina but is associated with a decreased expression of EAAT1. As the predominant expression of EAAT1 was in the nerve fiber layer and this structure is preferentially lost in glaucoma, it is not clear whether the decrease in transporter levels is a cause or an effect of cell death.
Grant support: EY02698, RPB, RRF (Walter Helmerich Chair to PLK), OPREF, EY10009
References:
1. Rauen T, Rothstein JD, Wässle H. Differential expression of three glutamate transporter subtypes in the rat retina. Cell Tissue Res. 1996;286:325–336. **2.** Rauen T, Kanner BI. Localization of the glutamate transporter GLT-1 in rat and macaque monkey retinae. Neurosci Lett. 1994;169:137–140. **3.** Arriza JL, Eliasof S, Kavanaugh MP, Amara SG. Excitatory amino acid transporter 5, a retinal glutamate transporter coupled to a chloride conductance. Proc Natl Acad Sci USA. 1997;94:4155– 4160. **4.** Honkanen RA, Baruah S, Zimmerman MB. *et al.* Vitreous amino acid concentrations in patients with glaucoma undergoing vitrectomy. Arch Ophthalmol. 2003; 121:183-188. **5.**Carter-Dawson L, Crawford ML, Harwerth RS. *et al.* Vitreal glutamate concentration in monkeys with experimental glaucoma. Invest Ophthalmol Vis Sci. 2002; 43:2633-2637.

P042 CIRCADIAN INTRAOCULAR PRESSURE IN PROSTAGLANDIN FP RECEPTOR KNOCK OUT MICE
C.A. Morris, J.G. Crowston, J.D. Lindsey, R.N. Weinreb
University of California San Diego, La Jolla, CA, United States of America

Introduction: The prostaglandin (PG) FP receptor is expressed in human ocular tissues. Topical application of PG F2a analogues that activate the FP receptor lower IOP and reduce circadian IOP fluctuation. It is, however, not known whether the FP receptor plays an important role in circadian regulation of intraocular pressure.
Purpose: The purpose of this study was to compare circadian IOP changes in FP receptor knockout mice with wild type mice that have normal FP receptor expression.
Methods: IOP was measured using microneedle cannulation of the anterior chamber in homozygous (FP-/- n=8), heterozygous (FP±, n=14) C57BL/6 background strain mice (FP+/+, n= 11) at 8 am, 2 pm and 8 pm. The investigator was masked to the mouse genotype at the time of the measurement. To confirm any differences in baseline IOP between genotypes, mid-afternoon IOP was measured in a separate population of FP-/- mice (n=8) FP± mice (n=28) and FP+/+ (n=11) wild type litter mates.
Results: There was no significant difference in IOP between genotypes at any of the three time points. Furthermore, there was no significant difference in the magnitude of circadian IOP variation between wildtype (mean±SEM, 1.82 mmHg ± 0.6), FP± mice (2.7mmHg ± 0.7) and FP-/- mice (2.7mmHg ± 1.2). Further IOP measurement in a larger population of FP knockouts and wild type littermates confirmed no difference in afternoon IOP.
Conclusions: There was n significant difference in baseline IOP or circadian IOP fluctuation between wild type and FP knockout mice. This indicates that the FP receptor does not play a critical role in circadian IOP regulation.
Supported by NIH grant Ey005990

5. EXPERIMENTAL GLAUCOMA

P043 ESTABLISHMENT OF A CHRONIC GLAUCOMA MODEL IN RHESUS MONKEY AND EVALUATING RELATED BIOLOGICAL CHARACTERISTICS
Y. Dai[1], X.H. Sun[1], W.Y. Guo[1], X.B. Yu[1], Y.M. Yang[2]
[1]Eye and ENT Hospital, Shanghai, China, [2]Fudan University, Shanghai, China

Aim of the study: To establish a chronic hypertensive glaucoma model by two types of laser photocoagulation in rhesus monkeys, evaluating the related biological characteristics in the model eyes.
Methods: Laser photocoagulation was applied to 15 adult rhesus monkeys by semiconductor frequency-doubled 532 laser and argon laser. The laser spot was aimed at the entire 360° functional trabecular meshwork using goniolens. A-scan, Heidelberg Retinal Tomograph and Retinal Flowmeter were applied to examine the topographic and blood flow parameters of the globe and optic disc in seven model eyes and control eyes.
Results: At the fourth week after initial pressure elevation, the average intraocular pressure was 48.4 ± 10.3 mmHg for frequency-doubled 532 laser, and 44.2 ± 7.0mmHg for argon laser. The successful rates of three times photocoagulation between two types of laser also have no significant difference. Compared with the control eyes, there are very significant differences of cup shape measure, cup area, cup/disc area ratio, rim area and mean retinal nerve fiber layer thickness in the model eyes, except for the disc area. There are also significant differences of axial length and anterior chamber depth between them. There is no significant difference of the volume, flow and velocity between the model eyes and the control eyes.
Conclusions: Two types of laser photocoagulation successfully induced the chronic hypertensive glaucoma model in rhesus monkeys. Compared with the control eyes, the model eyes presented characteristic glaucomatous morphological changes.
References:
1. Hare W, Ton H, Woldemussie E. Electrophysiological and histological measures of retinal injury in chronic ocular hypertensive monkeys[J]. Eur J Ophthalmol 1999; 9 Suppl 1:S30-33. **2.** Hare WA, Ton H, Ruiz G. Characterization of retinal injury using ERG measures obtained with both conventional and multifocal methods in chronic ocular hypertensive primates[J]. Invest Ophthalmol Vis Sci 2001 Jan;42(1):127-136. **3.** Pederson JP, Gassterland DE. Laser-induced primate glaucoma I.Progression of cupping[J]. Arch Ophthalmol 1984;102:1689-92. **4.** Quigley HA, Hohman RM. Laser energy levels for trabecular meshwork damage in the primate eye[J]. Invest Ophthalmol Vis Sci 1983;24:1305-1307. **5.** Wang RF, Schumer RA, Serle JB, *et al.* A comparison of argon laser and diode laser photocoagulation of the trabecular meshwork to produce the glaucoma monkey model[J]. J Glaucoma 1998;7(1):45-49. **6.** Kutner MH, Nachtschiem CJ, Wasserman W, *et al.* Applied Linear Statistical Models[M]. Boston: WCB McGraw-Hill,1996; 958-1009. **7.** Miglior S, Albe E, Guareschi M. Intraobserver and interobserver reproducibility in the evaluation of optic disc stereometric parameters by Heidelberg retina tomograph[J]. Ophthalmology. 2002;109(6): 1072-1077. **8.** Michelson G, Schmauss B, Langhans MJ, *et al.* Principle, validity, and reliability of scanning laser Doppler flowmetry[J]. J Glaucoma. 1996;5(2):99-105. **9.** Durukan AH, Yucel I, Akar Y, *et al.* Assessment of optic nerve head topographic parameters with a confocal scanning laser ophthalmoscope[J]. Clin Experiment Ophthalmol. 2004;32(3):259-264. **10.** Geijer C, Bill A. Effects of raised intraocular pressure on retinal, prelaminar, laminar, and retrolaminar optic nerve blood flow in monkeys[J]. Invest Ophthalmol Vis Sci 1978;18(10):1030-1041

6. CLINICAL EXAMINATION METHODS

Tonometry and CCT

P044 RELIABILITY OF DIGITAL PORTABLE TONOMETER FOR INTRAOCULAR PRESSURE MEASUREMENT THROUGH THE EYELID (TGDC-01)
D. Korogiannis, Sp. Georgaras, E.A. Skoufis
Ophthalmos Institute, Athens, Greece

Introduction: Goldmann applanation tonometry is currently the most useful method in the world. But what should we do when we want to measure IOP in eyes with an irregular corneal surface?
Purpose: To check the reliability of the digital portable tonometer for IOP measurements through the eyelid.
Material and methods: 1182 eyes (569 right and 613 left) from 811 patients (8 to 88 years old) had IOP measurement with Goldmann applanation and with the digital portable tonometer, both measurements taken by the same ophthalmologist (DK) from October 2003 to December 2004. In a study we evaluated eyes with primary open angle glaucoma (40% treated with Cosopt , 25% Xalatan and 35% combined therapy with both), primary angle closure glaucoma, neovascular glaucoma, keratoconus, radial keratotomy, neurotrophic keratopathy, acute iridocyclitis, Posner-Schlossmann syndrome, aniridia, vernal keratoconjuctivitis, old corneal chemical burns, infantile-juvenile glaucoma and Peter's anomaly. In some special cases, like keratoprothesis, the comparison of the results was done only by finger test due to the fact that it was impossible to take a Goldmann measurement.
Results: Comparing both IOP measurements, in the first group of eyes with an IOP range of 5 to 22 mm Hg we found no significant difference between the two methods of measurements (±1mm Hg). However in the second group of eyes with IOP from 24 to 60 mm Hg we found a variation ±4 mm Hg between the two tonometers.
Conclusions: The results of IOP measurements with two different types of tonometers were compared and there was agreement (±1mm Hg) when the IOP was from 5-22 mm Hg. The advantages of this method are a) no use of topical anesthetics b) no contact with the cornea. On the other hand, for all IOP measurements higher than 22 mm Hg the portable digital tonometer gave results that significantly varied from Goldmann tonometry.
References:
1. Operation manual for the digital portable tonometer of intraocular pressure through the eyelid TGDC-01 'PRA' **2.** Moses RA. The Goldmann applanation tonometers Am J Ophthalmol. 1973; 76:223-4 **3.** Goldmann H, Schmidt TH. Uber applanations-tonometrie Ophthalmologica 1957;134: 221-42 **4.** Friedenwald JS. Some problems in the calibration of tonometers. Am J. Ophthalmol. 1948;31:935-44 **5.** Foster CS, Yamamoto GK. Ocular rigidity in keratoconus. Am J. Ophthalmol. 1978;86:802-6 **6.** Friedenwald JS Contribution to the theory and practice of tonometry Am J Ophthalmol 1937;20:985-1024

P045 COMPARATIVE RESULTS OF CENTRAL CORNEAL THICKNESS MEASUREMENTS IN PRIMARY OPEN ANGLE GLAUCOMA, PSEUDOEXFOLIATION GLAUCOMA AND OCULAR HYPERTENSION
K.G. Kitsos, C. Pappa, S. Gorezis, A. Katsaraki
University Hospital of Ioannina, Ioannina, Greece

Introduction: Goldmann and Schmidt developed their applanation tonometry believing that there were no significant variations in corneal thickness. As clinical measurements of corneal thickness became widely available, several studies found positive correlation between corneal thickness and applanation measures.
Aim of the study: To evaluate the significance of central corneal thickness (CCT) in different types of glaucoma.
Methods: We performed a non-randomized clinical trial, using a specular microscope (Model SP2000P TopCon Corp) to assess the CCT in the following groups of patients: Group 1: 44 eyes with Primary Open Angle Glaucoma (POAG). Group 2: 38 eyes with Pseudoexfoliation Glaucoma (PXEG). Group 3: 16 eyes with Ocular Hypertension (OHT). Group 4: 52 eyes without glaucoma or ocular hypertension (control group). To compare the results, we performed statistical analysis using t-test for independent variables.
Results: Our results showed that CCT measured in Group 1 (POAG): 527,6±23,0μm, in Group 2 (PXEG): 523,1 ± 36,4μm, in Group 3 (OHT): 565,1 ± 42,5μm and in Group 4 (control group): 536,1 ± 23,4μm. In the 16 cases of OHT (Group 3), CCT measurements presented statistically significant higher values compared to those of all other groups. Furthermore in the 38 cases with PXEG (Group 2), CCT measurements presented statistically significant lower values, compared to those of the control group (Group 4). In the 44 cases of POAG (Group 1), CCT measurements showed no statistically significant differences in values compared to those of cases with PXEG (Group 2) and cases of control group (Group 4).
Conclusion: Our study shows that CCT was significantly thinner in cases with PXEG and significantly thicker in cases with OHT. These results agree with relative literature, strenghtening the position that CCT may affect intraocular pressure (IOP) measurements.
References:
1. Stodtmeister R. Applanation tonometry and correction according to corneal thickness. Acta Ophthalmol Scand. 1998;76(3):319-324. **2.** Shah S, Chatterjee A, Mathai M, Kelly SP, Kwartz J, Henson D, McLeod D. Relationship between corneal thickness and measured intraocular pressure in a general ophthalmology clinic. Ophthalmology. 1999 Nov;106(11):2154-60. **3.** Copt RP, Thomas R, Mermoud A. Corneal thickness in ocular hypertension, primary open-angle glaucoma, and normal tension glaucoma. Arch Ophthalmol. 1999;117(1):14-16. **4.** Bron AM, Creuzot-Garcher C, Goudeau-Boutillon S, d'Athis P. Falsely elevated intraocular pressure due to increased central corneal thickness. Graefes Arch Clin Exp Ophthalmol. 1999;237(3):220-224. **5.** Herman DC, Hodge DO, Bourne WM. Increased corneal thickness in patients with ocular hypertension. Arch Ophthalmol. 2001;119(3):334-336. **6.** Ventura AC, Bohnke M, Mojon DS. Central corneal thickness measurements in patients with normal tension glaucoma, primary open angle glaucoma, pseudoexfoliation glaucoma, or ocular hypertension. Br J Ophthalmol. 2001 Jul;85(7):792-5.

P046 IS RACE OR IRIS COLOR A DETERMINANT OF CENTRAL CORNEAL THICKNESS?
O.D. Semes, A.W. Shaikh, J.D. Bartlett, A. Xie
University of Alabama Birmingham, Birmingham, United States of America

Introduction: Central corneal thickness (CCT) influences measured IOP; with a thinner central cornea, IOP will be underestimated.[1,2] Thinner CCT represents a significant risk factor for glaucoma and may represent a surrogate for race.[1-3] Measured IOP varies with CCT and other factors, including race.[4-7]
Aim of the study: To determine whether iris color represents a qualitative surrogate for CCT adjustment of IOP.
Methods: IRB approval was obtained and participants signed informed consent. 130 eyes of

65 normal patients had IOP (Goldmann) and CCT measured. Demographic (name, DOB, race), BCVA, and iris color (Caucasian: blue, green, brown or African-American: brown) data were collected. Goldmann applanation tonometry and pachymetry were performed in that order. A difference of 40 microns between mean CCT was considered significant. A difference ($p<0.05$) was considered significant for mean measured and CCT-adjusted IOP.
Results: Mean CCT measurements among the Caucasians; blue (552 microns), green (552 microns), brown (562 microns) did not differ significantly. The same held true for IOP and CCT-adjusted IOP with iris color; (blue) 15.2 *vs.* 15.1, (green) 15.4 *vs.* 15.2, (brown) 14.7 *vs.* 14.0. CCT was significantly thinner in African-Americans (553 microns), whether including all Caucasians (555 microns, Chi Sq = 0.0388) or only the brown-iris Caucasians and African-Americans (562 microns vs. 533 microns, Chi Sq = 0.0302). Mean measured IOP was not significantly different between all Caucasians (15.1) and all African-Americans (15.8), but when IOP was adjusted for CCT, African-Americans showed significantly higher CCT-adjusted IOP (16.7) than Caucasians (14.8).
Conclusions: These results suggest that iris color is independent of CCT and does not influence measured IOP. We were able to establish a relationship between race and IOP when adjusting IOP for CCT. Our data show a a racial difference in CCT-adjusted IOP.
References:
1. Brandt JD. Beiser JA. Kass MA. Gordon MO. Central corneal thickness in the Ocular Hypertension Treatment Study (OHTS). Ophthalmology 2001; 108(10):1779-88. **2.** Tanaka GH. Corneal Pachymetry: A prerequisite to applanation tonometry? Arch Ophthalmol 1998; 116: 544-5. **3.** Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study: Baseline Factors That Predict the Onset of Primary Open-Angle Glaucoma. Arch Ophthalmol. 2002; 120:714-720. **4.** Shah S, Chatterjee A, Mathai M, *et al.* Relationship between corneal thickness and measured intraocular pressure in a general ophthalmology clinic. Ophthalmology 1999; 106: 2154-60. **5.** Doughty MJ. Zaman ML. Human corneal thickness and its impact on intraocular pressure measures: a review and meta-analysis approach. Surv Ophthalmol 2000; 44(5):367-408. **6.** Lleo A. Marcos A. Calatayud M. Alonso L. Rahhal SM. Sanchis-Gimeno JA. The relationship between central corneal thickness and Goldmann applanation tonometry. Clin Exp Optom 2003; 86(2):104-8. **7.** Shimmyo M, Ross AJ, Moy A, Mostafavi R. Intraocular Pressure, Goldmann Applanation Tension, Corneal Thickness, and Corneal Curvature in Caucasians, Asians, Hispanics, and African Americans. Am J Ophthalmol 2003;136:603–613. **8.** Higginbotham EJ, Gordon MO, Beiser JA. *et al.* The Ocular Hypertension Treatment Study: Topical Medication Delays or Prevents Primary Open-angle Glaucoma in African American Individuals Arch Ophthalmol, Jun 2004; 122: 813 - 820.

P047 CLINICAL COMPARISON OF REBOUND TONOMETER WITH GOLDMANN APPLANATION TONOMETER: INFLUENCE OF CENTRAL CORNEAL THICKNESS
A. Akman, S. Akca, A. Cetinkaya, Y. Akova
Baskent University, Ankara, Turkey

Purpose: This study was conducted to compare a new rebound tonometer (I-care, Tiolat, Finland) and the Goldmann applanation tonometer (GAT) in measuring intraocular pressure (IOP) and to evaulate the effect of central corneal thickness (CCT) on IOP measurements with these two devices.
Design: Prospective, observational case series.
Participants: Sixty eight eyes of 68 subjects.
Methods: Sixty-eight otherwise healthy subjects were tested for IOP with rebound tonometer and GAT by a single observer in random measurement sequence. The CCT was measured by an ultrasonic pachymeter (Tomey SP-3000, Japan). The eyes were divided into three groups according to CCT measurements using OHTS criteria: Group 1 as CCT<555 microm; Group 2 as CCT: 555-585 microm, and Group 3 as CCT>585 microm. Only the right eye measurements were used for statistical evaluation.
Main outcome measures: Assesment of accuracy of the rebound tonometer relative to GAT and evaluation of the effect of the CCT on IOP mesurements by these two tonometers.
Results: The two tonometers showed strong correlation in terms of IOP measurements ($r=0.78$, $p<0.001$). Bland and Altmann plots also showed a strong aggrement between the two measurement techniques. The mean CCT was 506 ± 29 microm in Group 1 (n=28), 569 ± 9 microm in Group 2 (n=20) and 612 ± 21 microm in Group 3 (n=20). The mean IOP levels measured by rebound tonometer and GAT were 14.9 ± 3.5 and 15.1 ± 3.3 mmHg in Group 1 ($p=0.587$), 14.1 ± 3.1 and 14.4 ± 3.0 mmHg in Group 2 ($p=0.5$), and 15.8 ± 4.2 and 15.6 ± 4.1 mmHg in Group 3 ($p=0.818$), consecutively.
Conclusion: The IOP values obtained with rebound tonometer were not different than those measured with GAT, and the two instruments were strongly correlated in terms of IOP levels. IOP measurements with rebound tonometer were influenced from the CCT in the same way with GAT.
References:
1. Kontiola A, Puska P. Measuring intraocular pressure with the Pulsair 3000 and Rebound tonometers in elderly patients without an anesthetic. Graefe's Arch Clin Exp Ophthalmol 2004; 242:3-7. **2.** Li J, Herndon LW, Asrani SG, Stinnett S, Allingham RR. Clinical comparison of the Proview eye pressure monitor with the Goldmann applanation tonometer and the TonoPen. Arch Ophthalmol 2004; 122:1117-1121. **3.** Rao VJ, Gnanaraj L, Mitchell KW, Figueiredo FC. Clinical comparison of ocular blood flow tonometer, TonoPen, and Goldmann applanation tonometer for measuring intraocular pressure in postkeratoplasty eyes. Cornea. 2001; 20:834-8. **4.** Brandt JD, Beiser JA, Gordon MO, Kass MA; Ocular Hypertension Treatment Study (OHTS) Group. Central corneal thickness and measured IOP response to topical ocular hypotensive medication in the Ocular Hypertension Treatment Study. Am J Ophthalmol. 2004; 138:717-722. **5.** Kaufmann C, Bachmann LM, Thiel MA. Comparison of dynamic contour tonometry with Goldmann applanation tonometry. Invest Ophthalmol Vis Sci 2004; 45:3118-3121.

P048 CENTRAL CORNEAL THICKNESS IN EYES WITH OCULAR HYPERTENSION AND IN NORMAL EYES
G.S. Galgauskas, G. Juodkaite, A. Damijonaityte
Vilnius University Hospital, Vilnius, Lithuania

Purpose: To determine the relationship between intraocular pressure (IOP) measured with Schiotz tonometer and central corneal thickness (CCT) in eyes with ocular hypertension and nonglaucomatous eyes with normal IOP.
Design: Randomised clinical trial.
Participants: Fifty-two patients (101 eyes) with diagnosed ocular hypertension and 24 persons (48 eyes) with normal IOP in nonglaucomatous eyes were examined in the outpatient department of Vilnius University Eye Clinic.
Methods: For all patients intraocular pressure was measured in the morning (8a.m.-10a.m.) with Schiotz tonometer. CCT was defined by means of ultrasound pachymeter (Quantel Medical B VI, France). Statistical analysis was done: all values were expressed as mean ± standard error (SE), statistical significance for difference of CCT in group with ocular hypertension and group with normal ocular pressure was tested (*t* Test $p<0.01$).
Main outcome measures: Intraocular pressure (mmHg) and central corneal thickness (µm) were estimated.
Results: Mean IOP was 24.25 ± 0.25mmHg in the group with ocular hypertension while in the group with normal ocular pressure it was 16.04 ± 0.32mmHg. Mean CCT in the eyes with ocular hypertension was 591.35 ± 2.82µm. In the eyes with normal IOP CCT was 519.81 ± 3.16µm. The difference of CCT in these groups is statistically significant.
Conclusions: Eyes with ocular hypertension showed increased central corneal thickness compared to eyes with normal ocular pressure.
References:
1. Copt RP, Thomas R, Mermoud A. Corneal thickness in ocular hypertension, primary open-angle glaucoma, and normal tension glaucoma. Arch Ophthalmol 1999; 117:14-16. **2.** Doughty MJ, Zaman-Human ML. Corneal thickness and its impact on intraocular pressure measures: a review and metaanalysis approach. Surv Ophthalmol 2000; 44:367-408. **3.** Brandt JD, Beiser JA, Kass MA. *et al.* Ocular Hypertension Treatment Study (OHTS) Group. Central corneal thickness in the ocular hypertensive study (OHTS). Ophthalmology 2001; 108:1779-88. **4.** Nemesure B, Wu SY, Hennis A, Leske MC, Barbados Eye Study Group. Corneal thickness and intraocular pressure in the Barbados eye studies. Arch Ophthalmol 2003; 121:240-244. **5.** Wolfs RC, Klaver CC, Vingerling JR, *et al.* Distribution of central corneal thickness and its association with intra-ocular pressure. The Rotterdam Study. Am J Ophthalmol 1997; 123:767-772. **6.** Aghaian E, Choe JE, Lin S, Stamper RL. Central corneal thickness of Caucasians, Chinese, Hispanics, Filipinos, African Americans and Japanese in a Glaucoma clinic. Ophthalmology 2004; 111:2211-2219.

P049 NEW TECHNIQUE FOR MEASUREMENT OF OCULAR STIFFNESS BY DYNAMIC ANALYSIS IN HUMAN
E. Sugimoto[1], H. Tsukamoto[1], J. Takenaka[1], K. Tokuda[2], T. Kawahara[2], U. Kurita[2], Y. Iida[2], R. Kempf[2], M. Kaneko[2], H. Mishima[1]
[1]Hiroshima University School of Medicine, Hiroshima, Japan, [2]Hiroshima Univ. Engineering, Hiroshima, Japan

Objective: Corneal stiffness is reported to influence the measurement of intraocular pressure (IOP). The purpose of this study is to develop a new technique for measuring ocular stiffness by dynamic analysis using a high sensitive camera and to examine individual difference in ocular stiffness.
Design: Experimental human eye study.
Participants: Sixty-one healthy subjects (50 males and 11 females, 19 - 42 years old).
Methods: IOP were measured by a non-contact tonometer and the deformations of cornea by the injected air on the corneal surface were recorded using a high sensitive camera which can take 2,000 photographs per second. Ocular stiffness was calculated by dynamic analysis of cornea deformation. Corneal curvature (CC) and central corneal thickness (CCT) were also measured and their correlations with ocular stiffness were analyzed.
Main outcome measure: Ocular stiffness.
Results: Ocular stiffness was 349 ± 64 N/m (range: 221 N/m to 497 N/m) and there was a large individual difference between subjects. CC, CCT and IOP were 7.80 ± 0.26 mm, 0.537 ± 0.031 mm, 14.9 ± 2.6 mmHg, respectively. The correlations of ocular stiffness with CC ($r=0.219$, $p=0.089$), CCT ($r=-0.049$, $p=0.706$) and IOP ($r=0.205$, $p=0.127$) were weak. Ocular stiffness seemed to be determined not only by CC, CCT and IOP but also by other factors.
Conclusions: Ocular stiffness is determined by multi-factors. There is an individual difference in ocular stiffness, therefore we should pay attention to ocular stiffness in measuring IOP.

P050 CHANGES IN CENTRAL CORNEAL THICKNESS ASSOCIATED WITH TOPICAL CORTICOSTEROID ADMINISTRATION IN INDIVIDUALS WITH UVEITIS
T. Sagara, S.H. Hirano, T. Uchida, K. Suzuki, M. Enoki, N. Kumagai, T. Nishida
Yamaguchi University School of Medicine, Ube, Yamaguchi, Japan

Introduction: The corneal stroma, which constitutes ~90% of the thickness of the cornea, is rich in collagen fibers. Given that collagen metabolism is influenced by corticosteroids, it might be expected that these compounds would also affect corneal thickness.
Aim of the study:To examine the possible effect of topical corticosteroid administration on central corneal thickness (CCT) in individuals with uveitis.
Methods: A total of 65 eyes of 36 patients with uveitis was treated with eyedrops containing either 0.1% betamethasone sodium phosphate or 0.1% fluorometholone. The mean age of the patients was 59 ± 17 years, and the mean period of application of eyedrops was 166 ± 129 weeks. A control group consisted of 80 eyes of 40 age-matched patients (59 ± 15 years) who had not been treated with steroids. CCT was measured by ultrasound pachymetry (SP-2000, Tomey).
Results: The CCT of the treated eyes of the uveitis patients was 510 ± 41 µm (mean ± SD), which was significantly smaller than that of the control group (529 ± 34 µm; $p = 0.002$, Student's *t* test). In all five patients with unilateral uveitis, the CCT of the treated eye was smaller than that of the normal eye. The CCT of the eyes treated for >2 years was significantly smaller than that of those treated for <2 years (498 ± 42 µm and 524 ± 35 µm, respectively; $p = 0.008$).
Conclusions: These results suggest that topical corticosteroid therapy may reduce corneal thickness, especially in patients treated for longer periods.

P051 CENTRAL CORNEAL THICKNESS IN PATIENTS WITH NORMAL-TENSION GLAUCOMA
M.I. Konareva-Kostianeva, M. Atanassov
Medical University - Plovdiv, Plovdiv, Bulgaria

Purpose: To compare the central corneal thickness (CCT) measurements between eyes with proved normal-tension glaucoma (NTG) and eyes without glaucoma.
Design: Prospective study.
Methods: The study included 30 consecutive patients with NTG (60 eyes) –1st group and 30 age - and gender matched non glaucoma patients (60 eyes) – 2nd group. CCT was measured using an ultrasonic pachymeter (Pach IV, Accutome). The mean CCT of NTG and controls were compared using independent samples t-test.
Results: The mean (±SD) CCT in NTG patients and non-glaucoma patients were 517.4 ± 19.2 µ and 549.0 ± 39.4 µ, respectively. There was significant difference between the groups regarding CCT ($P<0.001$). The mean IOP was higher in glaucomatous eyes (17.1 ± 2.3 *vs.*16.3 ±mm Hg, $P=0.028$). The visual acuity in NTG eyes was not significantly lower than in controls ($P=0.069$).
Conclusions: The results indicated that the patients with NTG have thinner central cornea than non glaucoma patients.
References:
1. Quaranta L, Battelli S, Plutino G, Gandolfo E. Evaluation of central corneal thickness in patients affected by ocular hypertension, primary open-angle glaucoma, normal tension glaucoma. Acta Ophthalmol Scand Suppl. 2002; 236: 249. **2.** Chen HC, Ho JD, Chang SHL, Chen YHS, Wu SC. Central corneal thickness of normal-tension glaucoma and non-glaucoma populations in ethnic Chinese. Chang Gung Medical Journal, 2004; 27: 50-55. **3.** Wasilewicz R, Pecold-Stepniewska H, Pecold K. Central corneal thickness measurements in normal tension glaucoma. Klin Oczna, 2004; 106 (1-2 Suppl): 236-237. **4.** Dave H. Kutschan A, Pauer A, Wiegand W. Measurements of corneal thickness in glaucoma patients. Ophthalmologe, 2004; 101(9): 919-924. **5.** Ehlers N, Hjortdal J. Corneal thickness: measurements and implications. Exp Eye Res, 2004; 78(3): 543-548.

P052 CENTRAL CORNEAL THICKNESS MEASUREMENTS IN OCULAR HYPERTENSION, GLAUCOMA AND CONTROL SUBJECTS
M. Atanassov, M.I. Konareva-Kostianeva
Medical University - Plovdiv, Bulgaria, Plovdiv, Bulgaria

Purpose: To assess central corneal thickness (CCT) in patients with open-angle glaucoma (OAG), ocular hypertension (OHT) and glaucoma suspects, compared to the CCT of control subjects.

Design: Prospective cohort study.
Methods: CCT was evaluated in 50 eyes of 25 patients with OHT (mean age 52 ± 12 years) – 1st group, 26 eyes of 13 glaucoma patients (mean age 64 ± 5 years) –2nd group, 46 eyes of 23 glaucoma suspects (mean age 60±9 years) – 3rd group and 144 eyes of 72 control subjects (mean age 61 ± 11 years). CCT was measured using an ultrasonic pachymeter (Pach IV, Accutome).
Results: The OHT patients showed mean CCT 582.9 ± 38.9µ. The mean CCT for the glaucoma patients was 552.4 ± 30µ, for the glaucoma-suspects – 551 ± 28.7 µ and for the controls - 549.5 ± 36.8 µ, respectively. Regarding the age the 1st group differs significantly from the 2nd group (P=0.007) and from the 4th group (P=0.001). CCT in eyes with OH was significantly greater, compared to eyes with OAG (P=0.003), to eyes with suspect glaucoma (P<0.001) and to control eyes (P<0.001) (ANOVA, with Bonferroni correction).
Conclusions: Our results suggest that OHT patients have thicker corneas, which should be taken into account when assessing risk for development of glaucoma.
References:
1. Gordon MO, Beiser JA, Brandt JD. *et al.* The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002; 120(6): 714-720. **2.** Realini T, Lovelace K. Measuring central corneal thickness with ultrasound pachymetry. Optom Vis Sci 2003; 80(6): 437-439. **3.** Phillips LJ, Cakanac CJ, Eger MW, Lilly ME. Central corneal thickness and measured IOP: a clinical study. Optometry 2003; 74(4): 218-225. **4.** Detry-Morel M. Use of corneal pachymetry in ocular hypertension and chronic glaucoma. Bull Soc Belge Ophthalmol 2004; 293: 35-43. **5.** Brandt JD. Corneal thickness in glaucoma screening, diagnosis, and management. Curr Opin Ophthalmol 2004; 15(2): 85-89.

P053 CENTRAL CORNEAL THICKNESS VERSUS STRATUS OCT MEASUREMENTS
M.F. Domingues, H. Monteiro, P. Costa, F. Matos, F. Falcão-Reis
S. João, Porto, Portugal

Purpose: To correlate the central corneal thickness and Stratus optical coherence tomography (OCT) measurements in normal, ocular hypertension, glaucoma suspects and glaucomatous eyes.
Participants and methods: A total of 424 eyes were selected from a glaucoma clinic at S.João Hospital. All patients underwent imaging with the OCT and ultrasonic handheld pachymeter (PacScan 300P). We examined the relationship between OCT optic nerve head parameters and RNFL measurements and the central corneal thickness.
Main outcome measures: Central corneal thickness, OCT RNFL thickness, OCT Rim volume, Cup-to-disc ratio.
Results: Central corneal thickness measurements in glaucomatous eyes were significantly lower than those in the other groups (542.7 ± 30.3µm vs. 567.1 ± 37.2 µm, p=0.0003). Higher vertical cup-to-disc ratios, lower rim volume results, and thinner RNFL thickness values were significantly correlated with thinner central corneal thickness measurements (r=-0,26 P<0.0001; r =0.21 P<0.0001 and r =0.12 P=0.0142, respectively).
Conclusion: Subjects with thinner corneas had significantly thinner RNFL thickness values and higher cup-to-disc ratios. These findings support the notion that central corneal thickness is important number in the glaucoma clinic.
Reference:
1. Henderson PA, Medeiros FA, Zangwill LM, Weinreb RN: Relationship between central corneal thickness and retinal nerve fiber layer thickness in ocular hypertensive patients. Ophthalmology. 2005; 112: 251-6.

P054 CENTRAL CORNEAL THICKNESS IN PSEUDOEXFOLIATIVE GLAUCOMA
M.F. Domingues, L. Torrão, D. Meira, P. Costa, F. Costa, F. Falcão-Reis
S. João, Porto, Portugal

Purpose: To compare the central corneal thickness in eyes with pseudoexfoliative glaucoma and primary open angle glaucoma.
Material and methods: A total of 17 eyes with pseudoexfoliative glaucoma and 17 eyes with primary open angle glaucoma were included in the study. Central corneal thickness was measured using an ultrasonic handheld pachymeter (PacScan 300P) by a trained observer. Statistical analysis was done with Student *t* test.
Main outcome measures: Central corneal thickness.
Results: In comparison to primary open angle glaucoma eyes, pseudoexfoliative glaucoma eyes presented inferior central corneal thickness measurements (523.5 ± 31.1µm *vs.* 559.3 ± 20.6 µm, p<0.0001).
Conclusion: Lower central corneal thickness results in pseudoexfoliative glaucoma. It could explain the underestimation of intraocular pressure and plays a role in the worst prognosis of this form of glaucoma.
References:
1. Ventura AC, Bohnke M, Mojon DS: Central corneal thickness measurements in patients with normal tension glaucoma, primary open angle glaucoma, pseudoexfoliation glaucoma, or ocular hypertension. Br J Ophthalmol. 2001; 85: 792-5. **2.** Bechmann M, Thiel MJ, Roesen B, Ullrich S, Ulbig MW, Ludwig K: Central corneal thickness determined with optical coherence tomography in various types of glaucoma. Br J Ophthalmol. 2000; 84: 1233-7. **3.** Inoue K, Okugawa K, Oshika T, Amano S: Morphological study of corneal endothelium and corneal thickness in pseudoexfoliation syndrome. Jpn J Ophthalmol. 2003; 47: 235-9.

P055 COMPARISON OF INTRAOCULAR PRESSURE MEASUREMENT BY GOLDMANN APPLANATION TONOMETER AND PULSATILE OCULAR BLOOD FLOW ANALYSER
I.J. Januleviciene[1], A. Harris[2], B. Siesky[2], L. McCranor[2], H.J. Garzozi[3]
[1]Eye Clinic, Kaunas, Lithuania, [2]Department of Ophthalmology, Indianapolis, IN, United States of America, [3]Bnai Zion Medical Center, Haifa, Israel

Background: Intraocular pressure (IOP) is the major known risk factor in glaucoma and the primer mover of the functional damage in glaucomatous patients but it is not a unique determinant of glaucomatous damage. Clinical assessment of glaucoma patients may not be a true reflection of overall IOP control. Evaluation of the effect of glaucoma medication is restricted by measurement of intraocular pressure (IOP) as a dynamic physiological parameter.
Purpose: To compare IOP measurements with Goldmann applanation tonometry to IOP fluctuation over time measured by pulsatile ocular blood flow analyser (POBFA) (Paradigm Medical Industries, Inc.).
Design: Prospective one year follow-up study (continuing previously reported randomised cross-over study).
Participants: Thirty primary open angle glaucoma patients.
Intervention: Sixteen patients received Dorzolamide/timolol fixed combination (D/T) and 14 latanoprost 0.005% treatment.
Main outcome measures: Changes in IOP, POBFA and perfusion pressure dynamics.
Results: There was no statistically significant difference in baseline IOP parameters between two study groups: 15.69 ± 2.02 mmHg with D/T and 16.71 ± 2.84mmHg with latanoprost (p= 0.314). After one year both D/T and latanoprost showed statistically significant tachyphylaxis effect: by 2.31mmHg (p=0.007) and 2.72mmHg (p=0.004) respectively. POBFA measured IOP showed increase in 1.74mmHg (p=0.026) with D/T and 3.13 mmHg (p=0.007) with latanoprost after one year. Goldmann applanation tonometry results correlated strongly with POBFA readings. Multiple regression analysis revealed no important blood flow factors as predictors in the increase of IOP.
Conclusions: Both drugs showed tachyphylaxis effect after one year. We found a strong correlation between POBFA and Goldmann tonometry. POBFA is a quickly performed technique producing convenient and practical information with acceptable reproducibility about IOP fluctuation over time.
References:
1. Asrani S, Zeimer R, Wilensky J, Gieser D, Vitale S, Lindenmuth K. Large diurnal fluctuations in intraocular pressure are an independent risk factor in patients with glaucoma. J Glaucoma 2000;9:134-142. **2.** Yang YC, Illango B, Cook A, Batterbury M. Intraocular pressure and pulse rate measurements by the OBF tonograph to reference instruments. Ophthalmic Physiol Opt 2000;20: 401-407. **3.** Bonomi L, Marchini G, Marraffata M, Bernardi P, Morbio R, Varoto A. Prevalence of glaucoma and intraocular pressure distribution in a defined population. The Egna-Neumarkt study. Ophthalmology 1998;105:209-215. **4.** Lusky M, Harris A, Kagemann L, Rechtmann E, Sheets C, Kumar R. *et al.* Blood Pressure Dominates IOP in Effects on Ocular Perfusion Pressure (abstract). 2003 Annual Meeting Abstract and Program Planner accessed at www.arvo.org. Association for Research in Vision and Ophthalmology. Abstract 367. **5.** Januleviciene I, Harris A, Kagemann L, Siesky B, McCranor L. A comparison of the effects of Dorzolamide/Timolol fixed combination versus Latanoprost on intraocular pressure and pulsatile ocular blood flow in primary open-angle glaucoma patients. Acta Ophthalmol Scand 2004;82:730-737.

P056 CLINICAL COMPARISON OF THE TONOPEN® AND ICARE® (REBOUND TONOMETER) WITH THE GOLDMANN APPLANATION TONOMETER AND THE EFFECT OF CENTRAL CORNEAL THICKNESS
U. Eksioglu, I. Yalvac, B. Satana, G. Ozkan, F. Ornek, S. Duman
Ankara Training and Research Hospital, Ankara, Turkey

Introduction: IOP remains the most significant causative risk factor for glaucoma, and lowering IOP remains the cornerstone of treatment. Tonometry is important in the diagnosis and management of glaucoma. The Goldmann applanation tonometer is the internationally accepted 'gold standard'.
Aim: To compare intraocular pressure (IOP) values obtained by patients using the TonoPen and Icare with those measured with the Goldmann tonometer and the effect of central corneal thickness on results.
Methods: Fourty patients (a total of 80 eyes) with a diagnosis of glaucoma and a control group of twenty two patients (44 eyes) successfully completed the study. The IOP was measured by three methods in the following order: Goldmann tonometer, TonoPen, and Icare. The central corneal thickness was measured by an ultrasonic pachymeter separately for each eye, the differences in mean IOP values between measurement methods were assessed with paired *t* tests and also in multivariate models that tested the dependence of IOP difference on central corneal thickness.
Results: There was a significant difference (P=0) in the mean IOPs measured by the Goldmann *vs* TonoPen for both eyes; results obtained by Icare were quite similar with Goldman and the difference was independent of the central corneal thickness in all groups. Results are similar in the control group.
Conclusions: The IOPs obtained with the TonoPen are significantly higher than those measured with Goldmann tonometer. Variations of the central corneal thickness do not contribute to the difference. Intraclass correlations of IOP values obtained with the Goldmann and the Icare or TonoPen are not strong. The TonoPen cannot replace the Goldmann tonometer in the sense that it will give the same readings of IOP. The accuracy of the TonoPen is increased, if at least two measurements are taken per eye and then averaged. Results measured by Icare are similar with Goldmann but it can not be used in supine position which is important in children needed evaluation under general anesthesia.
References:
1. Horowitz GS, Byles J, Lee J, D'Este C. Comparison of the TonoPen and Goldmann tonometer for measuring intraocular pressure in patients with glaucoma. Clin Experiment Ophthalmol. 2004; 32: 584-9. **2.** Gunvant P, Baskaran M, Vijaya L, Joseph IS, Watkins RJ, Nallapothula M, Broadway DC, O'Leary DJ. Effect of corneal parameters on measurements using the pulsatile ocular blood flow tonograph and Goldmann applanation tonometer.Br J Ophthalmol. 2004; 88: 518-22 **3.** Li J, Herndon LW, Asrani SG, Stinnett S, Allingham RR. Clinical comparison of the Proview eye pressure monitor with the Goldmann applanation tonometer and the TonoPen. Arch Ophthalmol. 2004; 122: 1117-21 **4.** Shih CY, Graff Zivin JS, Trokel SL, Tsai JC. Clinical significance of central corneal thickness in the management of glaucoma. Arch Ophthalmol. 2004; 122: 1270-5. **5.** Herndon LW, Weizer JS, Stinnett SS. Central corneal thickness as a risk factor for advanced glaucoma damage. Arch Ophthalmol. 2004; 122: 17-21

P057 CENTRAL CORNEA THICKNESS IN MYOPIA WITH AND WITHOUT GLAUCOMA
E. Patsea[1], A. Amariotakis[1], G. Amariotakis[1], G.T. Georgopoulos[2]
[1]Ophthalmiatrion Eye Hospital of Athens, Athens, Greece, [2]Athens University Medical School, Athens, Greece

Purpose: This prospective study investigates differences in the central cornea thickness (CCT) of myopic patients with and without glaucoma.
Methods: A total of 29 patients (58 eyes) with glaucoma and axial myopia ≥ 3D were included in the study. An age-matched group of 26 myopic patients (52 eyes) without glaucoma was used as control. In both groups the CCT was measured by means of ultrasound pachymetry. A mean of three consecutive measurements was used.
Results: There was no statistically significant difference in age (p = 0,48) and myopia (p = 0,39) between both groups. The mean CCT was 552,14 ± 38,78µ in glaucoma patients and 555,98 ± 42,97µ in the control group. This difference was not statistically significant (p = 0,62). In the glaucoma group there was a statistically significant correlation between myopic correction ≥-6D and corneal thickness (Pearson's r = -0,443 and 0,05 < p < 0,01).
Conclusion: Our results showed that CCT in high myopic patients with glaucoma correlates with myopic correction. Thicker corneas in high myopia might be a risk factor for glaucoma.

P058 PREDICTION OF AGIS VISUAL FIELD DEFECT SCORE USING CORNEAL SHAPE, THICKNESS, BIOMECHANICAL PROPERTIES, AND MULTIPLE MEASURES OF INTRAOCULAR PRESSURE
C.J. Roberts, R.D. Johnson, E.E. Herderick, P.A. Weber
The Ohio State University, Columbus, OH, United States of America

Purpose: To investigate the relationship of corneal shape, corneal thickness, corneal biomechanical properties, and intra-ocular pressure (IOP) measured by multiple technologies, with visual field loss in primary open angle glaucoma (POAG).
Methods: 34 eyes of 17 subjects previously diagnosed with POAG had the following parameters prospectively acquired during a regularly scheduled office visit: IOP via Goldman Applanation Tonometry (GAT), IOP and corneal hysteresis via Reichert Ocular Response Analyzer (ORA), as well as corneal curvature, central corneal thickness and peripheral corneal thickness at 4 positions via Orbscan II Corneal Topography. Visual field (VF) tests were quantified with the Advanced Glaucoma Intervention Study (AGIS) VF defect score. A subset of 22 eyes of 11 subjects also had IOP and ocular pulse pressure measured via Pascal Dynamic Contour Tonometry (DCT). Stepwise regression analysis was performed to predict AGIS VF score from the independent variables. In order to control for biomechanical properties, which are assumed

to be matched between eyes in a single subject, a pairwise analysis was performed on a subset of patients (n=8) who had a contralateral difference in AGIS VF score between eyes of 2 units or greater.
Results: In the overall analysis, only corneal thickness significantly (p< 0.05) predicted AGIS VF score with a negative correlation, although variability was high (Rsquare = 0.12). When DCT IOP was included, pulse pressure significantly (p=0.05) predicted AGIS VF score, also with a negative correlation (Rsquare = 0.17). In the contralateral comparison, DCT IOP was significantly greater than GAT IOP in both eyes, with a significantly greater difference (P<0.006) in the eyes with the higher AGIS VF score (GAT IOP minus DCT IOP = -3.8 ± 2.1mm Hg in the eyes with the higher score and –2.3 ± 2.4mm Hg in the contralateral eyes with the lower AGIS VF score). Corneal thickness, pulse pressure, and corneal hysteresis were NOT significantly different between eyes in the contralateral comparison, demonstrating control of possible confounding variables between eyes.
Conclusions: The contralateral comparison demonstrated that thickness alone is insufficient to correct for the artifact in IOP measured by GAT, when the confounding effect of corneal biomechanical properties was removed. Assuming DCT is closer to true pressure[1,2] the greatest underestimation of IOP by GAT occurred in the eyes with the higher AGIS VF score, indicating that an uncontrolled IOP may be masked by artifact in the GAT measurement in this small pilot study.
References:
1. Liu J., Roberts, C.J. Influence of Corneal Biomechanical Properties on Intraocular Pressure Measurement: Quantitative Analysis.' Journal of Cataract and Refractive Surgery, 2005; 31(1): 146-155. **2.** Kniestedt, C., Nee M, Stamper R.L. Dynamic Contour Tonometry. Archives of Ophthalmol. 2004;122:1287-1293.

P059 FLUCTUATIONS OF IOP IN MEDICALLY CONTROLLED VERSUS SURGICALLY CONTROLLED GLAUCOMATOUS PATIENTS: A PROSPECTIVE RANDOMISED TRIAL
K. Mansouri[1], A. Mermoud[1], I. Haefliger[2], S. Orgul[2], J. Flammer[2], T Shaarawy[2]
[1]Jules Gonin Eye Hospital, Lausanne, Switzerland, [2]University Eye Clinic Basel, Basel, Switzerland

Purpose: To compare the IOP fluctuations of glaucoma patients treated with latanaprost 0.005% once daily to patients with controlled IOP after deep sclerectomy or trabeculectomy.
Methods: The medical group consisted of 20 patients using latanaprost 0.005% monotherapy; the surgical groups included 20 patients after trabeculectomy (TE), and 20 patients after deep sclerectomy with collagen implant (DSCI) (all IOPs < 18 mmHg). All patients underwent a diurnal tension curve (8.00 – 17.00/3-hour intervals), followed by a water-drinking test (WDT) and IOP measurement at 21.00. The between-group differences were tested for significance by means of parametric analysis of variance.
Main outcome measures: Diurnal IOP fluctuations.
Results: Baseline IOPs at 8.00 am were significantly lower in the TE group (10.1 ± 4.4 mmHg), followed by the DSCI group (13.9 ± 2.8 mmHg) and the latanaprost group (15.5 ± 2.0 mmHg) (p < 0.05). Fluctuations in diurnal IOP and IOP peak were significantly lower in the TE group compared to the other groups at any point of examination. No differences were found between DSCI and latanaprost. When adjusting for IOP at presentation (8.00am), no significant differences could be found between the groups. Mean IOP increase following WDT was 25% in the TE group. This change was 28% (DSCI) and 32% (latanaprost) and was not significant in any of the three groups.
Conclusion: When adjusting for baseline IOP, which was significantly lower in the TE group, no significant differences could be seen between the medical and the surgical groups in terms of diurnal IOP fluctuation and response to WDT.
References:
1. Asrani S, Zeimer R, Wilensky J, Gieser D, Vitale S, Lindenmuth K. Large diurnal fluctuations in intraocular pressure are an independent risk factor in patients with glaucoma. J Glaucoma. 2000; 9: 134-42. **2.** Wilensky JT. The role of diurnal pressure measurements in the management of open angle glaucoma. Curr Opin Ophthalmol. 2004;15: 90-2. **3.** Liu JH, Zhang X, Kripke DF, Weinreb RN. Twenty-four-hour intraocular pressure pattern associated with early glaucomatous changes. Invest Ophthalmol Vis Sci. 2003 Apr;44(4):1586-90. **4.** Hughes E, Spry P, Diamond J. 24-hour monitoring of intraocular pressure in glaucoma management: a retrospective review. J Glaucoma. 2003; 12: 232-6. **5.** Shaarawy T, Flammer J, Haefliger IO. Reducing intraocular pressure: is surgery better than drugs? Eye. 2004; 16: [Epub ahead of print]. **6.** Medeiros FA, Pinheiro A, Moura FC, Leal BC, Susanna R Jr. Intraocular Pressure Fluctuations in Medical versus Surgically Treated Glaucomatous Patients. J Ocular Pharmacol Ther. 2002; 18: 489-498. **7.** Yoshikawa K, Inohue T, Inohue Y. Normal Tension glaucoma: The value of predictive tests. Acta Ophthalmol, 1993; 71: 463-70. **8.** Chen CH, Lu DW, Chang CJ *et al*. The application of water-drinking test on the evaluation of trabeculectomy patency. J Ocular Pharmacol Ther. 2000; 16:37-42. **9.** Warter G and Jeannenot N. Elévation tensionnelle oculaire provoquée par un test à l'eau. Ophthalmologica 1991; 202:75-80. **10.** Orzalesi N, Rossetti L, Invernizzi T, Bottoli A, Autelitano A. Effect of timolol, latanaprost, and dorzolamide on cicadian IOP in glaucoma or ocular hypertension. Invest Ophthalmol Vis Sci. 2000; 41: 2566-73. **11.** Konstas AG, Mylopoulos N, Karabatsas CH, Kozobolis VP, Diafas S, Papapanos P, Georgiadis N, Stewart WC. Diurnal intraocular pressure reduction with latanoprost 0.005% compared to timolol maleate 0.5% as monotherapy in subjects with exfoliation glaucoma. Eye. 2004; 18: 893-9. **12.** Susanna R, Nicoleta MT, Soriano DS, Carvalho CA. Automated perimetry: a study of the glaucoma hemifield test for detection of early glaucomatous visual field loss. J Glaucoma, 1994; 3:12-16. **13.** L E Pillunat, Larsson LI, and the European and Canadian Latanaprost Study Group. Intraocular Pressure after replacement of current dual therapy with latanaprost monotherapy in patients with open angle glaucoma. Br J Ophthalmol 2003; 87: 1492-96. **14.** Winder AF, Siddiqui AA, Donovan HC. Ocular hypertension and systemic responses to the water-drinking test. Br J Ophthalmol. 1978 Jun;62(6):414-9.
Sussana R Jr, Sheu WP; Latin American Glaucoma Society. Comparison of latanoprost with fixed-combination dorzolamide and timolol in adult patients with elevated intraocular pressure: an eight-week, randomized, open-label, parallel-group, multicenter study in Latin America. Clin Ther. 2004; 26: 755-68. **15.** Rasmussen KE, Jorgensen HA. Diagnostic value of the water-drinking test in early detection of simple glaucoma. Acta Ophthalmol (Copenh). 1976; 54: 160-6. **16.** Kronfeld PC. Water drinking and outflow facility. Invest Ophthalmol. 1975; 14: 49-

P060 ULTRASONIC PACHYMETRY EVALUATION OF THE CENTRAL CORNEAL THICKNESS IN PATIENTS WITH PSEUDOEXFOLIATIVE SYNDROME WITH AND WITHOUT INCREASED IOP
K.K. Koev, R. Georgiev, M.K. Kostalevska, V.V. Velchev
Univ. Hospital Alexandrovska, Sofia, Bulgaria

Introduction: Recent studies have revealed patients with different values of the central corneal thickness (CCT) in different types of glaucoma: normal-tension glaucoma (NTG), primary open-angle glaucoma (POAG), pseudoexfoliative glaucoma (PXE), chronic angle closure glaucoma (CACG), glaucoma suspect (GS) eyes[1,2,3,4]. It has been found that the CCT measurement has an important role in the diagnostics of glaucoma[4,5,6,7,8].
Purpose: To assess the relationship between CCT and tonometric pressure in patients with pseudoexfoliative syndrome without increased IOP and patients with pseudoexfoliative glaucoma.
Methods: Fifty two patients divided into three groups: first group of 20 (40 eyes) patients with normal IOP without glaucoma – controls; second group of 18 (36 eyes) patients with pseudoexfoliative syndrome with normal IOP and third group of 14 (24 eyes) patients with pseudoexfoliative glaucoma. The measurement of the CCT in all patients was performed with an ultrasonic pachymeter and one-way analysis of variance was used to compare corneal thickness between groups. The IOP was measured by Goldmann applanation tonometer (GAT).
Results: In the control group the IOP was mean 16.42± 1.21 mmHg. The second group had IOP values mean 17.12± 1.35 mmHg. The third group showed increased IOP values 25.53± 1.47 mmHg. The ultrasound pachymetry findings in the control group were (mean 552.3mu [SD 36.8 mu]) . The second group pseudoexfoliative syndrome with normal IOP (mean 550.5 mu [SD 33.7 mu]). The third group with pseudoexfoliative glaucoma had the lowest CCT values (mean 530.1 mu [SD 32.6 mu]) compared to the former two groups and the difference is statistically significant (p < 0.001)
Conclusion: Our results show that the increased IOP correlates with a decrease in the CCT. The CCT measurement, therefore, is desirable in patients attending for all types of glaucoma assessment including pseudoexfoliative glaucoma. Pachymetry-measured central corneal thickness has a significant effect on the clinical management of patients with pseudoexfoliative glaucoma and glaucoma suspect.
References:
1. Shih,CY; Graff-Zivin, JS; Trokel, SL; Tsai, JC Clinical significance of central corneal thickness in the management of glaucoma. Arch-Ophthalmol. 2004 Sep; 122(9): 1270-5 **2.** Ventura, AC; Bohnke, M; Mojon, DS. Central corneal thickness measurements in patients with normal tension glaucoma, primary open angle glaucoma, pseudoexfoliation glaucoma, or ocular hypertension. Br J Ophthalmol. 2001 Jul; 85(7): 792-5 **3.** Miglior, S; Albe, E; Guareschi, M; Mandelli, G; Gomarasca, S; Orzalesi, N Intraobserver and interobserver reproducibility in the evaluation of ultrasonic pachymetry measurements of central corneal thickness: Br J Ophthalmol. 2004 Feb; 88(2): 174-7 **4.** Medeiros,FA; Sample,PA; Weinreb,RN Corneal thickness measurements and frequency doubling technology perimetry abnormalities in ocular hypertensive eyes. Ophthalmology. 2003 Oct; 110(10): 1903-8 **5.** La Rosa, FA; Gross,RL; Orengo-Nania,S Central corneal thickness of Caucasians and African Americans in glaucomatous and nonglaucomatous populations. Arch-Ophthalmol. 2001 Jan; 119(1): 23-7 **6.** Shah, S; Spedding, C; Bhojwani, R; Kwartz, J; Henson, D; McLeod, Assessment of the diurnal variation in central corneal thickness and intraocular pressure for patients with suspected glaucoma. Ophthalmology. 2000 Jun; 107(6): 1191-3 **7.** Shah, S; Chatterjee, A; Mathai, M; Kelly, SP; Kwartz, J; Henson, D; McLeod, D **8.** Relationship between corneal thickness and measured intraocular pressure in a general ophthalmology clinic. Ophthalmology. 1999 Nov; 106(11): 2154-60

P061 THE EFFECT OF CORNEAL THICKNESS, AXIAL LENGTH AND CORNEAL CURVATURE ON IOP MEASUREMENTS TAKEN BY APPLANATION TONOMETRY, TONOPEN AND OBF
G. Boehm, M. Kohlhaas, S. Rose, E. Spoerl, L.E. Pillunat
University of Dresden, Dresden, Germany

Purpose: To examine if there is an influence of corneal thickness, corneal curvature and axial length on tonopen and OBF tonometry in comparison to applanation tonometry.
Design: Prospective clinical trial.
Participants: 57 patients with cataract undergonig phacoemulsification (19 m and 38 w, mean age 72.8 ± 9.6y, mean corneal thickness 549.3 ± 38.7 µm, mean corneal curvature K1=43,60 ± 1,62D and K2=42,73 ± 1,62D)
Methods: One eye of each patient was examined. Before phacoemulsification the anterior chamber was canulated at the temporal corneal limbus. In a closed system the IOP was adjusted to 20 mmHg by manometric watercolumn. IOP was measured with the Perkins tonometer, tonopen and the ocular blood flow system (OBF).
Main outcome measures: IOP, Corneal thickness, corneal curvature, axial length.
Results: At the IOP level of 20mmHg mean IOP readings were 20.72 ± 2.08mmHg with applanation tonometry (p=0.11), 17.52 ± 3.94mmHg with tonopen (p=0.001) and 15.82 ± 2.67mmHg for OBF (p=0.001). Applantion tonometry readings were positively correlated to corneal thickness (p=0.001), but not to corneal curvature (p=0.468), and axial length (p=0.344). TonoPen readings were not correlated to corneal thickness (p=0.450), corneal curvature (p=0.183) and axial length (p=0.379). OBF readings were correlated to corneal curvature (p=0.008), but not to corneal thickness (p=0.077), and axial length (p=0.170).
Conclusion: Applanation tonometry readings are affected by corneal thickness, and OBF readings by corneal curvature. TonoPen measurements are not influenced by corneal thickness, corneal curvature and axial length. Therefore, tonopen seems to be a good alternative for IOP measurements if corneal thickness or curvature needs to be considered.
References:
1. Whitacre MM, Stein RA Sources of error with use of Goldmann-type tonometers. Surv Ophthalmol. 1993; 38:1-30 **2.** Whitacre MM, Stein RA, Hassanein K The effect of corneal thickness on applanation tonometry. Am J Ophthalmol. 1993; 115:592-596 **3.** Shah S, Chatterjee A, Mathai M Relationship between corneal thickness and measured intraocular pressure in a general ophthalmology clinic. Ophthalmology. 1999; 106:2154-2160 **4.** Ehlers N, Bramsen T, Sperling S Applanation tonometry and central corneal thickness. Acta Ophthal Kbh. 1975; 53:34-43 **5.** Goldmann H, Schmidt T Über Applanationstonometrie. Ophthalmologica. 1957; 134:221-242

P062 COMPARISON OF THE ACCURACY OF THE TONOPEN AND SCHIOTZ TONOMETERS IN DETERMINING THE INTRAOCULAR PRESSURE IN PATIENTS WITH CONGENITAL GLAUCPMA
M. Razeghinejad[1], H. Amini[2], N. Amini[2]
[1]Shiraz University, Shiraz, Iran, [2]Tehran University of Medical Science, Tehran, Iran

Introduction: The Goldman applanation tonometer is still the gold standard for measuring the intraocular pressure(IOP)[1,2,3] but can not be used for checking the IOP in infants with congenital glaucoma. The TonoPen and Perkins applanation tonometers are the usual instruments for checking the IOP in these patients and both have good correlation in determining the IOP[1].The accuracy of TonoPen in checking the IOP is comparable with Goldman applanation tonometer[4]. Chiara *et al* [2] reported comparable reliability of Schiotz with Perkins but Bordon concluded that the Schiotz measurments were significantly higher than those obtained with the Perkins and TonoPen[5].The TonoPen and Perkins tonometers may not be available in all centers, so we performed this study for comparing the accuracy of Schiotz tonometer with TonoPen.
Aim of the study: To compare the accuracy of the TonoPen and Schiotz tonometers in measurement of IOP in patients with congenital glaucoma.
Methods: Thirty eight eyes of 20 patients with congenital glaucoma enrolled in this study. The mean age of the patients was 19.37(14.52 standard deviation) months. After induction of anesthesia with Halothane 3% for one minute or less. When the eyes were in primary position the IOP was checked first by TonoPen and then by Schiotz tonometers.
Results: The mean IOP that was checked by TonoPen was 19.39(8.51 SD)mm-Hg and 18.44(8.1 SD)mm-Hg by Schiotz (p=0.164).
Conclusion: Good correlation were achieved between the TonoPen and Schiotz tonometers. Lower cost and comparable reliability makes the Schiotz tonometer a viable option for checking the IOP in patients with congenital glaucoma.
References:
1. Eisenberg DL, Sherman BG, McKeown CA, Schuman JS.Tonometry in adults and children, A manometric evaluation of pneumatonometr, applanation, and TonoPen *in vitro* and *in vivo*. Ophthalmology 1998; 105:1137-81. **2.** Chiara GF, Semes LP, Potter JW, Cutter GR, Tucker WR. Portable tonometers: a clinical comparison of applanation and identation devices. J Am Optom Assoc.1989; 60:105-10. **3.** Rao VJ, Gnanaraj L, Mitchell KW, Figueiredo FC. Clinical comparison of ocular blood flow tonometer, TonoPen, and Goldmann applanation tonometer

for measuring intraocular pressure in postkeratoplasty eyes. Cornea 2001; 20: 834-8. **4.** Bandyopadhyay M, Raychaudhuri A, Lahiri Sk, *et al.* Comparison of Goldman applanation tonometry with the TonoPen for measuring intraocular pressure in a population – based glaucoma survey in rural west Bengal.ophthalmic Epidemiol. 2002; 9: 215-24. **5.** Bordon AF,Katsumi O,Hirose T.Tonometry in peadiatric patients : a comparative study among TonoPen, Perkins, and Schiotz tonometrs. J Peadiatr Ophthalmol strabismus.1995; 32: 373-7.

P063 DYNAMIC CONTOUR TONOMETRY *VERSUS* GOLDMAN APPLANATION TONOMETRY FOR THE MEASUREMENT OF INTRAOCULAR PRESSURE IN THICK AND THIN CORNEAS

A.T. Doyle, Y. Lachkar
Fondation Hôpital St. Joseph, Paris, France

Purpose: To compare Goldman applanation tonometry (GAT) with Dynamic contour tonometry in the measurement of IOP in structurally normal corneas over a wide range of central corneal thickness(CCT).
Design: Prospective method comparison analysis of DCT and GAT.
Methods: 25 patients each with normal corneal thickness (CCT=520-580µm:group A), thin corneas (CCT<520µm: group B) and thick corneas (CCT>580µm: group C) had two measurements each of intraocular pressure (IOP) with the dynamic contour tonometer (DCT) and the Goldman applanation tonometer(GAT). Exclusion criteria included corneal pathology, a history of corneal surgery or astigmatism >3.5D. One eye per patient was randomly selected for analysis. Corneal thickness was measured using ultrasound pachymetry. 95% agreement limits for DCT with GAT were calculated using data from group A. The relationship of the inter-tonometer differences in IOP measurement at all levels of CCT were analysed by plotting GAT-DCT against the CCT and calculating the slope of this line in each section of the graph.
Main outcome measures: 1. Mean IOP with GAT and DCT for each group. 2. Repeatability: the standard deviation (SD) of the differences between the 2 measurements for each tonometer
Results: In group A (mean CCT=552 ± 16µm) the mean GAT was 15.9 ± 3.1mmHg and mean DCT was 16 ± 3.3mmHg (p=0.91). In group B (mean CCT= 491 ± 19µm) the mean GAT was 13.2 ± 3.5mmHg, significantly lower than the mean DCT of 15.9 ± 3.5mmHg (p=0.009). For group C (mean CCT=615 ± 22µm), the mean GAT was 17.4±3.8mmHg and the mean DCT was 17.4 ± 3.5mmHg (p=0.95). The mean GAT-DCT difference was –2.6 ± 1.9mmHg in thin corneas and –0.06 ± 2.6mmHg in thick corneas. There was no tendency in group C for either instrument to measure consistently higher or lower that the other. The repeatability was 0.52mmHg for GAT and 0.62mmHg for DCT. The 95% agreement limits for DCT with GAT were –3.1mmHg to +2.9mmHg. Below 520µm, a reduction of 10µm in CCT appears to result in a significant underestimation of the IOP using GAT, by 0.7mmHg relative to DCT (p<0.001) and above 580µm there appears to be a non-significant overestimation of 0.2mmHg per 10µm increase in CCT using the GAT relative to the DCT (p=0.27). [figure 1]
Conclusion: Although DCT and GAT agree well on average, the agreement limits are wide. DCT may give a more accurate assessment of the true IOP in structurally normal thin corneas. Measurements of IOP with DCT appear to correlate well with suggested conversion factors for corneal thickness based on previous manometric experiments. However it does not appear to have any benefit over GAT in thick corneas.
References:
1. Doughty MJ, Saman ML. Human corneal thickness and its impact on intraocular pressure measures: a review and meta-analysis approach. Surv. Ophthlamol 2000;44(5):367-408 **2.** Siganos DS, Papasterigiou GI, Moedas C. Assessment of the Pascal dynamic contour tonometer in monitoring intraocular pressure in unoperated eyes and eyes after LASIK. J Cataract Refract Surg 2004; 30:746-751 **3.** Kaufman C, Bachmann LM, Thiel MA. Intraocular pressure measurements using dynamic contour tonometry after laser in situ keratomileusis. Invest Ophthalmol Vis Science 2003;44(9):3790-3794 **4.** Kaufman C, Bachmann LM, Thiel MA. Comparison of dynamic contour tonometry with Goldman applanation tonometry. Invest Ophthalmol Vis Science 2004;45(9):3118-3121 **5.** Kniestedt C, Nee M, Stamper RL. Dynamic contour tonometry: a comparative study on human cadaver eyes. Arch. Ophthalmol.2004;122(9):1287-93

P064 INTRAOCULAR PRESSURE MEASUREMENT AFTER PHOTOREFRACTIVE KERATECTOMY (PRK) WITH THE PASCAL DYNAMIC CONTOUR TONOMETER

L. Speicher, A. Ramharter, W. Philipp
Innsbruck Medical University, Innsbruck, Austria

Introduction: Reduction of central corneal thickness (CCT) after corneal refractive surgery may result in inaccurate low intraocular pressure (IOP) measurements using Goldmann applanation tonometry (GAT). In contrast, Pascal dynamic contour tonometer (DCT; Ziemer Ophthalmic Systems AG, Switzerland) was shown to measure IOP indepent of CCT.
Aim of the study: To compare the difference of IOP measurements between GAT and DCT after photorefractive keratectomy (PRK).
Methods: Both, GAT and DCT were performed in 20 eyes of 11 patients (mean age 31,45 years; range 24-61 years) before and one month to 10 years (mean 33,7 months) after PRK for correction of their myopia (mean -4,28 ± 2,3 diopters) using the Zeiss Meditec MEL 70 Excimer Laser. All measurements were performed in triplicate. CCT was determined before and after PRK using optical pachymetry (Orbscan II; Orbtek, Salt Lake City, UT) at the same timepoints as measurements of IOP. Differences of mean pre- and postoperative GAT and DCT values were statistically compared in relation to pachymetry readings using GB-Stat professional software V9.0 for MS Windows (Dynamic Microsystems, Inc.)
Results: Mean postoperative GAT values of 13,1 mmHg ± 2,13 (SD) were statistically significantly lower than preoperative GAT values of 14,45 mmHg ± 2,33 (SD) well corresponding to a mean reduction of CCT of 77,05 microns ± 38,99 (SD). However, this was not the case for mean postoperative DCT values of 16,65 mmHg ± 2,68 (SD) which were statistically significantly higher (3.55 mmHg ± 2,63, mean ±SD) than postoperative GAT values (p<0.0001). A significant positive correlation was found between values of CCT reduction and postoperative differences of DCT and GAT readings (p<0.01).
Conclusions: DCT has been shown to measure IOP accurately, independent of corneal thickness[1,2]. In the present study we could clearly show that GAT may not be appropriate for IOP measurement after PRK since mean GAT readings were significantly lower than DCT readings (p<0.0001).
References:
1. Kaufmann C, Bachmann LM, Thiel MA. Comparison of dynamic contour tonometry with goldmann applanation tonometry. Invest Ophthalmol Vis Sci 2004;45:3118-21. **2.** Kaufmann C, Bachmann LM, Thiel MA. Intraocular pressure measurements using dynamic contour tonometry after laser in situ keratomileusis. Invest Ophthalmol Vis Sci 2003;44:3790-4.

P065 COMPARISON OF PASCAL CONTOUR TONOMETRY AND GOLDMANN APPLANATION TONOMETRY IN GLAUCOMA PATIENTS AND HEALTHY SUBJECTS

E.M. Hoffmann[1], L. Barleon[2], N. Pfeiffer[2], F.H. Grus[2]
[1] University of Mainz, Germany, [2]Dept. of Ophthalmology, Mainz, Germany

Introduction: Measurement of the intraocular pressure is important in ophthalmologic practice. Goldmann applanation tonometry has become the goldstandard for IOP measurements. A new digital tonometer has been introduced as a competitor to the Goldmann applanation tonometer[1-5].
Aim of the study: To compare the measurement of intraocular pressure (IOP) obtained by PASCAL Contour Tonometry (PCT) with Goldmann Applanation Tonometry (GAT) in glaucoma patients and healthy subjects.
Methods: 107 glaucoma patients and 73 healthy subjects were included prospectively. (Mean age 66 years ± 11 years, and 34 years ± 17 years, respectively). Glaucoma diagnosis was based on abnormal optic disk exam and repeatable abnormal visual field results using automated perimetry. In a randomized order, three consecutive IOP measurements were performed by one observer using both instruments on all subjects. Furthermore, ultrasonic pachymetry was performed on all eyes. T-tests were performed to describe differences in the IOP between the two groups. Pearson Correlation coefficients (r) were obtained to determine the relationship between the two instruments.
Results: Mean IOP values in glaucoma patients were significantly higher compared to healthy subjects, measured with both devices (PCT: 20.5 ± 7.4 mm Hg *vs.* 14.7 ± 2.6 mm Hg, GAT: 20.2 ± 8.1 mmHg *vs.* 13.7 ± 3.3 mm Hg). No significant difference in mean IOP values between both instruments was found (P>0.05). Mean IOP values obtained by both instruments were significantly correlated in both groups (Glaucoma: Correlation coefficient r= 0.97, Control: Correlation coefficient r=0.82, P < 0.05). Central Corneal Thickness (CCT) did not differ statistically significant in both groups (Glaucoma group 544.7 ± 34.5 µm *vs.* Control group 543.7 ± 30.4 µm). Furthermore ANOVA revealed no significant effect of corneal thickness on the IOP measurement for both groups (glaucoma and healthy subjects) and both instruments. The DCT is able to measure additionally the ocular pulse amplitude (OPA). The OPA in glaucoma patients (2.85 ± 1.1 mm Hg) was significantly higher compared to healthy subjects (2.13 ± 0.66 mm Hg, P<0.05).
Conclusion: PCT and GAT revealed a good correlation in IOP measurements of glaucoma and healthy eyes. In eyes with CCT < 520µm, and >550µm, IOP values using GAT and PCT did not differ statistically significant. The new PCT is a promising tool for measurement of intraocular pressure and ocular pulse amplitude.
References:
1. Hoffmann EM, Grus FH, Pfeiffer N. Intraocular pressure and ocular pulse amplitude using dynamic contour tonometry and contact lens tonometry. BMC Ophthalmol. 2004;4:4. **2.** Kaufmann C, Bachmann LM, Thiel MA. Comparison of dynamic contour tonometry with goldmann applanation tonometry. Invest Ophthalmol Vis Sci. 2004;45:3118-21. **3.** Kaufmann C, Thiel MA, Valavanis A, Landau K. Normalisation of ocular pulse amplitude after embolisation of dural cavernous sinus arteriovenous fistula. Klin Monatsbl Augenheilkd. 2004;221:431-4. **4.** Kniestedt C, Nee M, Stamper RL. Accuracy of dynamic contour tonometry compared with applanation tonometry in human cadaver eyes of different hydration states. Graefes Arch Clin Exp Ophthalmol. 2004. **5.** Kniestedt C, Nee M, Stamper RL. Dynamic contour tonometry: a comparative study on human cadaver eyes. Arch Ophthalmol. 2004;122:1287-93.

P066 CORRELATION BETWEEN MIOP AND INTRACAMERAL IOP AT VARIOUS CCT IN RABBITS

Y. Liu[1], X. Chen[2], C. Luan[2]
[1]West China Hospital, Chengdu, China, [2]West China Eye Center, Chengdu, China

Purpose: To compare measured IOP (mIOP) with intracameral IOP before and after PRK.
Design: Prospective comparative observational study.
Methods: Thirty-two New Zealand rabbits were divided into eight groups (four rabbits for each). The central cornea was thinned by photorefractive keratectomy (PRK) to a desired thickness in right eye for each group. The left eye was designed as control.
Main outcome measures: The mIOP, intracameral IOP and CCT (central cornea thickness) were measured with Perkins applanation tonometer, manometer and ultrasonic pachymeter.
Results: The mIOP and intracameral IOP were 12.86 ± 2.63mmHg and 13.21 ± 2.16mmHg before PRK, 10.42 ± 2.31mmHg and 12.50 ± 2.11mmHg one month later post-PRK.
Conclusion: The CCT can affect the mIOP value. The thinner the central cornea was, the lower the IOP measured.
References:
1. Lee GA, Khaw PT, Ficker LA, *et al*: The corneal thickness and intraocular pressure story: where are we now? Clin Experiment Ophthalmol 2002; 30:334-337 **2.** Michael J: Human corneal thickness and its impact on intraocular pressure measures. Surv Ophthalmol 2000; 44:367-408 **3.** Montes-Mico R, Charman WN: Intraocular pressure after excimer laser myopic refractive surgery. Ophthalmic Physiol Opt 2001; 21: 228-235 **4.** Richard Stodtmeister, Martina Kron, Wilhelm Gaus, *et al*: IOP measurement and central corneal thickness. Br J Ophthalmol 2002; 86:120-121 **5.** Orssengo GJ, Pye DC: Dertermination of the true intraocular pressure and modulus of elasticity of the human cornea *in vivo*. Bull Math Biol 1999; 61:551-572 **6.** Herndon LW, Choudhri SA, Cox T, Damji KF, *et al*: Central corneal thickness in normal, glaucomatous, and ocular hypertensive eyes. Arch Ophthalmol 1997; 115:1137-1141 **7.** Feltgen N, Leifert D, Funk J: Correlation between central corneal thickness, applanation tonomtery, and direct intracameral IOP readings. Br J Ophthalmol 2001; 85:85-87

P067 CENTRAL CORNEAL THICKNESS AND SCLERA THICKNESS IN PRIMARY OPEN-ANGLE GLAUCOMA, OCULAR HYPERTENSION AND NORMAL TENSION GLAUCOMA IN COMPARISON WITH NORMAL EYES

J Mohamed Noor[1], A. Azuara-Blanco[2], H.R Atta[2], Y.S Wong[2], T Leslie[2], P Maharajan[2], R Siddiqui[2], C Cobb[2], R Mendis[2]
[1]Hospital Kuala Lumpur, Kuala Lumpur, Malaysia, [2]Aberdeen Royal Infirmary, Aberdeen, United Kingdom

Objective: In this study the correlation between central corneal thickness (CCT) and scleral thickness (ST) in Ocular Hypertension (OHT), Primary Open Angle Glaucoma (POAG), Normal Tension Glaucoma (NTG) and normal individuals were assessed. In addition, the CCT and ST in glaucomatous subjects were all compared to normal controls.
Design: The study is an observational case control study.
Participants and/or controls: A total of one hundred and twenty four subjects (31 with OHT, 31 with POAG, 31 with NTG and 31 normal individuals) with CCT and ST measurements.
Intervention: Central corneal thickness was determined with an ultrasonic pachymetry (DGH-1000, DGH Technology Inc, Frazer, PA, USA) and scleral thickness was measured by ultrasonic biomicroscopy (UBM).
Main outcome measures: Correlation between mean CCT and mean ST. Comparison of CCT and ST between groups.
Results: One hundred and twenty-four patients (31 with OHT, 31 with POAG, 31 with NTG and 31 normal individuals) were enrolled. The study included 61 women (14 with OHT; 16 with POAG; 15 with NTG and 16 controls) and 63 men (17 with OHT; 15 with POAG; 16 with NTG and 15 controls). There was no significant difference between the distribution of females and males when compared between groups (P=0.95). When the age of patients were compared between groups *i.e.* OHT (66.97 ± 11.96 years), POAG (74.68 ± 7.62 years), NTG (69.84 ± 11.02 years) and controls (70.23 ± 11.95 years), no significant difference was found. However, patients with OHT and NTG were significantly younger than the patients with POAG (P< 0.05; Student's *t* test). There was a weak correlation between CCT and ST seen amongst the study population as a whole (r=0.251, P<0.01). The correlation between CCT and ST was mainly seen amongst patients with NTG (r=0.448, P<0.05). However, no correlation was seen between CCT and ST amongst patients with OHT, POAG and normal subjects. Mean CCT of patients with OHT was 548.1 ± 30.4 µm, POAG was 519.4 ± 42.9 µm, NTG was 505.8 ± 27.2 µm and control was 529.9 ± 43.4 µm. The CCT was found to be thicker in patients with OHT as compared to POAG or NTG (p=0.004 and p<0.01 respectively). There was also a significant difference seen when the CCT in NTG was compared to normal subjects (p=0.011). Mean ST of patients with OHT was 755.0 ± 69.6 µm; POAG was 738.5 ± 66.8 µm; NTG was 708.7 ± 71.6 µm and controls were

724.5 ± 73.3 µm. The sclera thickness was found to be thicker in patients with OHT when compared to NTG (p=0.012).
Conclusion: There was a weak correlation between CCT and ST in general. This was mainly seen in patients with NTG which displayed a moderate correlation between CCT and ST. The CCT was found to be thicker in OHT subjects when compared to POAG or NTG. Incidentally subjects with NTG was found to have thinner corneas when compared to normal subjects. However, when comparison between groups was made in respect of ST, OHT subjects have thicker ST when compared to individuals with NTG.
References:
1. Doughty MJ, Zaman ML. Human corneal thickness and its impact on intraocular pressure measures : a review and meta analysis approach. Surv Ophthalmol 2000,44:367-408. **2.** Ehlers N, Hansen FK. Central corneal thickness in low tension glaucoma. Acta Ophthalmol (Copenh), 1974,52:740-6. **3.** Ehlers N, Bramsen T, Sperling S. Applanation tonometry and central corneal thickness. Acta Ophthalmol (Copenh) 1975,53:34-43. **4.** Herndon LW, Choudhri SA, Cox T *et al.* Central corneal thickness in normal, glaucomatous and ocular hypertensive eyes. Arch Ophthalmol 1997,115:1137-41. **5.** Johnson M, Kass MA, Moses RA, Grodzki WJ. Increased corneal thickness simulating elevated intraocular pressure. Arch Ophthalmol, 1978,96:664-5. **6.** Whitacre MM, Stein RA, Hassein K. The effect of corneal thickness on applanation tonometry . AM J Ophthalmol 1993,115:592-6. **7.** Argus WA. Ocular hypertension and central corneal thickness. Ophthalmology 1995,102:1810-2. **8.** Wolfs RCW, Klaver CCW, Vingerling JR *et al.* Distribution of central corneal thickness and its association with intraocular pressure. The Rotterdam study. Am J Ophthalmol 1997,123:767-72. **9.** Stodmaister R. Applanation tonometry and correction according to corneal thickness. Acta Ophthalmol Scand 1998,76:319-24. **10.** Copt RP, Thomas R, Mermoud A. Corneal thickness in ocular hypertension, primary open-angle glaucoma and normal tension glaucoma. Arch Ophthalmol 1999,117:14-6. **11.** Shah S, Chatterjee A, Mathai M *et al.* Relationship between corneal thickness and measured intraocular pressure in a general ophthalmology clinic. Ophthalmology 1999,106:2154-60. **12.** Herman DC, Hodge DO, Bourne WM. Increased corneal thickness in patients with ocular hypertension. Arch Ophthalmol 2001,119:334-6. **13.** Brandt JD, Beiser JA, Kass MA *et al.* Central corneal thickness in the Ocular Hypertension Treatment Study (OHTS). Ophthalmology 2001,108:1779-88. **14.** Medeiros FA, Sample PA, Weinreb RN. Ophthalmology 2003,110(10):1903-8. **15.** Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study. baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714–20.

P068 INTRAOCULAR PRESSURE MEASUREMENT - COMPARISON OF DYNAMIC CONTOUR TONOMETRY AND GOLDMANN APPLANATION TONOMETRY

ES Schneider, FG Grehn
University Eye Clinic, Würzburg, Würzburg, Germany

Purpose: The dynamic contour tonometer (DCT, Pascal tonometer) was recently introduced as a new method of intraocular pressure measurement, supposedly independent of corneal properties. In this study we analysed the correlation of dynamic contour tonometry and Goldmann applanation tonometry (GAT) and investigated the influence of central corneal thickness (CCT) and corneal curvature. We also considered preferential patient groups for both methods.
Methods: In a prospective study of 100 eyes without glaucoma, intraocular pressure was measured using DCT and GAT, followed by measurements of CCT and corneal curvature.
Results: A clear correlation between DCT and GAT was found (R = 0.693; P = 0.000). DCT generally resulted in higher IOP measurements (median difference ± 1.8 mmHg). Unlike DCT, GAT was remarkably affected by CCT (Fig.1), but neither method was significantly influenced by corneal curvature (Fig. 2). In order to obtain valid readings, DCT required a more extensive selection of patients than GAT.
Conclusions: DCT seems to be a reliable method for IOP measurement which, unlike GAT, is not influenced by CCT. In clinical practice, advantages from DCT can be expected for cooperative patients, outpatients, and patients with sufficient bilateral ocular fixation, whereas GAT measurements are more reliable in case of patients with inadequate cooperation, poor vision or nystagmus.
References:
1. Kanngiesser HE, Nee M, Kniestedt C., *et al.* Simulation of Dynamic Contour Tonometry compared to in - vitro study revealing minimal influence of corneal radius and astigmatism. The theoretical foundations of Dynamic Contour Tonometry. Invest Ophthalmol Vis Sci. 2003 44:E-Abstract 2641. **2.** Kaufmann C, Bachmann LM, Thiel MA. Comparison of dynamic contour tonometry with Goldmann applanation tonometry. Invest Ophthalmol Vis Sci. 2004;45:3118-3121. **3.** Kniestedt C, Nee M, Stamper RL. Dynamic Contour Tonometry (DCT) and its dependence on Corneal Hydration in Human Cadaver eyes. Arch Ophthalmol. 2004 Sept;122(9):1287-93. **4.** Wirthlin AC, Siganos DD, Papastergiou G, Kanngiesser H. Dynamic contour tonometry for IOP measurement after LASIK, a comparison with Goldmann tonometry. Synopsis of paper presented at DOC, Nürnberg 2002. **5.** Kniestedt C, Nee M, Stamper RL. Accuracy of dynamic contour tonometry compared with applanation tonometry in human cadaver eyes of different hydration state. Graefes Arch Clin Exp Ophthalmol. 2004 Oct 13.

P069 CENTRAL CORNEAL THICKNESS AND SCLERA THICKNESS IN PRIMARY OPEN-ANGLE GLAUCOMA, OCULAR HYPERTENSION AND NORMAL TENSION GLAUCOMA, IN COMPARISON WITH NORMAL EYES

J. Mohamed Noor[1], A. Azuara-Blanco[2], H.R. Atta[2]
[1]Hospital Kuala Lumpur, Kuala Lumpur, Malaysia, [2]Aberdeen Royal Infirmary, Aberdeen, United Kingdom

***Introduction*:** In recent years the measurements of central corneal thickness (CCT) has been found to be important in the evaluation of patients with glaucoma especially ocular hypertension (OHT) and normal tension glaucoma (NTG)[1]. A number of studies have shown that the corneas of OHT patients tend to be thicker and NTG tend to be thinner[2-13]. It has also been suggested that patients with OHT with thinner corneas are more likely to develop early glaucomatous functional damage[14]. In fact, a recent report of the Ocular Hypertension Treatment Study showed that CCT was found to be a powerful predictor of development of primary open-angle glaucoma among ocular hypertensive eyes[15]. Eyes with CCT of 555 m or less had a three-fold greater risk of glaucoma developing than participants who had CCT of more than 588 m. Perhaps thinner corneas are indicators of weaker eyes and it is possible that the sclera thickness may also be thinner and perhaps more vulnerable to the damage induced by intraocular pressure. Currently, determination of CCT is part of the routine clinical assessment in glaucoma clinics. However, a careful review of the literature reveals that little is known about the sclera thickness (ST) in individuals with glaucoma. The correlation between CCT and ST in glaucomatous eyes has also not been assessed. Perhaps patients with thinner corneas may also have thinner sclera. In this study the correlation between CCT and ST in glaucomatous and non-glaucomatous individuals were assessed. In addition, the ST in OHT, POAG and NTG were all compared to normal controls. The study is an observational case control study.
***Materials and methods*:** There were a total of 124 subjects. Thirty-one patients with OHT, 31 patients with POAG, 31 patients with NTG and 31 control subjects were recruited. The study was conducted at the Eye Clinic, Aberdeen Royal Infirmary, Aberdeen, Scotland between November 2003 to May 2004. Patients consenting to participate in the study and who met the inclusion and exclusion criteria were enrolled into the study. Informed consent was obtained from all participants. The Grampian Research Ethics Committee had approved all protocols. Ocular hypertension was defined as having an intraocular pressure (IOP) of greater than 21mmHg on 2 successive visits, open angles on gonioscopy, a normal Humphrey 24-2 visual field and a normal appearing optic disc. Primary open angle glaucoma was defined as having an IOP of greater than 21mmHg without treatment, an open angle on gonioscopy, abnormal Humphrey 24-2 visual field and a glaucomatous appearance of the optic disc including pathological excavation, notching of the neuroretinal rim, with or without optic disc haemorrhage. Normal tension glaucoma was defined an IOP of no greater than 21 mmHg without treatment, an open angle on gonioscopy, abnormal Humphrey 24-2 visual field and a glaucomatous appearance of the optic disc including pathological excavation, notching of the neuroretinal rim, with or without optic disc haemorrhage. The inclusion criteria were a transparent and reflective cornea and central fixation. In individuals with previous surgery the non-operated eye will be taken into the study. The exclusion criteria were previous keratorefractive surgery, previous or current sclera or corneal disease (*i.e.* corneal dystrophies and degenerations, infections, etc.), corneal transplantation, contact lens wear or patients with a refractive error *i.e.* myopia or hyperopia, of > 6 diopters (D) or astigmatism of more than 1D. Also excluded were individuals with an incisional surgery at the temporal meridian. In all patients, the right eye was selected for the investigation unless it does not fulfill the inclusion criteria. CCT was measured by ultrasonic pachymetry (DGH-1000, DGH Technology Inc, Frazer, PA) by an examiner. During the examination each patient was asked to blink before CCT measurement to avoid any bias because of corneal drying. The measurements were made at the center of the cornea of each eye and the final measurement was based on an average of five readings. ST was measured using ultrasonic biomicroscopy (UBM) 2 mm posterior to the scleral spur in the temporal meridian due to its easy accessibility. ST measurements were based on four readings and they were performed by a single examiner (JMN). The examiners who perform the pachmetry and UBm were masked to the results of the fellow test. The age, gender, type of glaucoma, CCT and ST were recorded on a database. Correlation between CCT and ST measurements was evaluated by regression analysis. Statistical analysis was also performed using Student's *t* test in comparing age, CCT and ST between groups.
***Results*:** One hundred and twenty-four patients (31 with OHT, 31 with POAG, 31 with NTG and 31 normal individuals) were enrolled. The study included 61 women (14 with OHT; 16 with POAG; 15 with NTG and 16 controls) and 63 men (17 with OHT; 15 with POAG; 16 with NTG and 15 controls). There was no significant difference between the distribution of females and males when compared between groups (P=0.95). When the age of patients were compared between groups *i.e.* OHT (66.97 + 11.96), POAG (74.68 + 7.62) and NTG (69.84 + 11.02) were compared with controls (70.23 + 11.95) no significant difference was found. However, patients with OHT and NTG were significantly younger than patients with POAG (P< 0.05; Student's *t* test). Mean CCT of patients with OHT was 548.1 + 30.4 µm, POAG 519.4 + 42.9 µm, NTG 505.8 + 27.2 µm and controls was 529.9 + 43.4 µm. Mean ST of patients with OHT was 755.0 + 69.6 µm, POAG 738.5 + 66.8 µm, NTG708.7 + 71.6 µm and controls were 724.5 + 73.3 µm. There was a no correlation between CCT and ST seen amongst the study population as a whole (r=0.251, P<0.01, Power of study 90%). However, there was a moderate correlation seen between CCT and ST among the patients with NTG (r=0.448, P<0.05).
***Conclusion*:** There is no correlation between CCT and ST in general. However, there is a moderate correlation between CCT and ST in patients with NTG.
References:
1. Doughty MJ, Zaman ML. Human corneal thickness and its impact on intraocular pressure measures : a review and meta analysis approach. Surv Ophthalmol 2000,44:367-408. **2.** Ehlers N, Hansen FK. Central corneal thickness in low tension glaucoma. Acta Ophthalmol (Copenh), 1974,52:740-6. **3.** Ehlers N, Bramsen T, Sperling S. Applanation tonometry and central corneal thickness. Acta Ophthalmol (Copenh) 1975,53:34-43. **4.** Herndon LW, Choudhri SA, Cox T *et al.* Central corneal thickness in normal, glaucomatous and ocular hypertensive eyes. Arch Ophthalmol 1997,115:1137-41. **5.** Johnson M, Kass MA, Moses RA, Grodzki WJ. Increased corneal thickness simulating elevated intraocular pressure. Arch Ophthalmol, 1978,96:664-5. **6.** Whitacre MM, Stein RA, Hassein K. The effect of corneal thickness on applanation tonometry . AM J Ophthalmol 1993,115:592-6. **7.** Argus WA. Ocular hypertension and central corneal thickness. Ophthalmology 1995,102:1810-2. **8.** Wolfs RCW, Klaver CCW, Vingerling JR *et al.* Distribution of central corneal thickness and its association with intraocular pressure. The Rotterdam study. Am J Ophthalmol 1997,123:767-72. **9.** Stodmaister R. Applanation tonometry and correction according to corneal thickness. Acta Ophthalmol Scand 1998,76:319-24. **10.** Copt RP, Thomas R, Mermoud A. Corneal thickness in ocular hypertension, primary open-angle glaucoma and normal tension glaucoma. Arch Ophthalmol 1999,117:14-6. **11.** Shah S, Chatterjee A, Mathai M *et al.* Relationship between corneal thickness and measured intraocular pressure in a general ophthalmology clinic. Ophthalmology 1999,106:2154-60. **12.** Herman DC, Hodge DO, Bourne WM. Increased corneal thickness in patients with ocular hypertension. Arch Ophthalmol 2001,119:334-6. **13.** Brandt JD, Beiser JA, Kass MA *et al.* Central corneal thickness in the Ocular Hypertension Treatment Study (OHTS). Ophthalmology 2001,108:1779-88. **14.** Medeiros FA, Sample PA, Weinreb RN. Ophthalmology 2003,110(10):1903-8. **15.** Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study. baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714–20.

P070 INTRAOCULAR PRESSURE VARIABILITY AFTER SITTING TO SUPINE POSITIONING AND AFTER WATER DRINKING TEST

MH Hatanaka[1], L. Sakata[1], R.M. Vessani[1], R. Susanna Jr.[2]
[1]Hospital das Clínicas, Sao Paulo, Brazil, [2]University of Sao Paulo, Sao Paulo, Brazil

Introduction: Glaucomatous progression may result from intra-ocular pressure (IOP) peaks not detected by single office IOP measurements. Almost one third of patients with single IOP measurements at office hours have pressure peaks only detected during a 24 hour daily tension curve (DTC) which, in spite of its importance, is not always feasible in the routine practice. On the other side, a modified DTC may miss as much as 70% of IOP peaks. Previous studies reported IOP rise in glaucomatous patients by changing the body position from sitting to supine. Also, IOP peaks and fluctuations can be evaluated by the water provocative drinking test (WDT). The response to this test was also considered a risk factor for the development of glaucomatous progression in POAG.
Purpose: To evaluate IOP variability by moving the body from sitting to supine position and by the WDT in POAG and normal patients.
Design: Cross sectional observational analysis of 31 eyes of 31 POAG and 14 eyes of 14 normal subjects.
Participants: Primary open angle glaucoma patients under clinical therapy.
Main outcome measures: Mean modified diurnal tension curve (mDTC) IOP, IOP in sitting and supine position, IOP peak and variability after water drinking test
Methods: Patients were submitted to a modified diurnal tensional curve (mDTC) followed by Perkins tonometry at the sitting and supine position, and then a WDT was performed in each patient. Student's *t* test and ANOVA for repeated measurement with group as fixed variable were used when appropriated. Statistical significance was considered at p < 0.05.
Results: The mean mDTC IOP in normal and POAG subjects was 15.49 ± 3.53 mmHg and 15.56 ± 3.25 mmHg respectively (p = 0.95). When the subjects moved to the supine position, IOP increased 1.36 ± 1.34 mmHg and 2.84 ± 2.21 mmHg respectively (p=0.02). After WDT, IOP fluctuation was 2.71 ± 0.99 mmHg in the normal group *versus* 4.13 ± 2.33 mmHg in POAG patients (p=0.007). Mean IOP increase after water ingestion was higher in comparison to IOP increase after moving from sitting to supine position (p=0.02).
Conclusion: POAG eyes demonstrated significant IOP rise after changing the body from sitting to supine position and after WDT. The IOP variability detected by the WDT was significantly higher than the IOP increase after moving the body from sitting to supine position.
References:
1. Kidd MN, O´Conner M. Progression of field loss after trabeculectomy: a five-year follow-up. Br J Ophthalmol 1985; 69: 827-31. **2.** Schulzer M, Mikelberg FS, Drance SM. Some observations on the relation between intraocular pressure and the progression of glaucomatous visual field loss. Br J Ophthalmol 1987;71: 486-488. **3.** O´Brien C, Schwartz B, Takamoto T, Wu DC.

Intraocular pressure and the rate of visual field loss in chronic open-angle glaucoma. Am J Ophthalmol 1991;111: 491-500. **4.** Chauhan BC, Drance SM. The relationship between intraocular pressure and visual field progression in glaucoma. Graefes Arch Clin Exp Ophthalmol 1992; 230:521-526. **5.** Drance SM. Diurnal variation of intraocular pressure in treated glaucoma. Arch Ophthalmol 1963;70:302-311. **6.** Zeimer RC, Wilensky JT, Gieser DR. Association between intraocular pressure peaks and progression of visual field loss. Ophthalmology 1991; 98:64-69. **7.** Katavisto M. The diurnal variations of ocular tension in glaucoma. Acta Ophthalmol 1994; 78 (suppl):1-131. **8.** Asrani S, Zeimer R, Wilensky J. Large diurnal fluctuations in intraocular pressure are an independent risk factor in patients with glaucoma. J Glaucoma 2000;9:134-142. **9.** Takahashi WY, Susanna R. Reprodutibilidade da curva tensional diária em dias não consecutivos. Arq. Bras Oftalmol 1979; 42:277. **10.** Rodrigues LD, Silva MRB, Schellini AS, Jorge EM. Picos de pressão intra-ocular: comparação entre curva tensional diária, mini-curva e medida da PIO às 6:00h. Arq Bras Oftalmol 2004;67:127-31. **11.** Yoshikawa K, Inohue T, Inohue Y. Normal tension glaucoma: The value of predictive tests. Acta Ophthalmol 1993;71:463-470. **12.** Armaly MF, Krueger DE, Maunder L. Biostatistical analysis of the Collaborative Glaucoma Study. I. Summary report of the risk factors for glaucomatous visual-field defects. Arch Ophthalmol 1980; 98: 2163-2171.

P071 CIRCADIAN INTRAOCULAR PRESSURE IN PROSTAGLANDIN FP RECEPTOR KNOCK OUT MICE

J.G. Crowston, C.A. Morris, J.D. Lindsey, R.N. Weinreb
Hamilton Glaucoma Center, UCSD, La Jolla, CA, United States of America

Objective: The prostaglandin (PG) FP receptor is expressed in human ocular tissues[1]. Topical application of PG F2α analogues that activate the FP receptor lower IOP and reduce 24-hour IOP fluctuation in the human. We have recently demonstrated that aqueous humor dynamics can be measured reliably in the mouse[2] and that mouse IOP also has a circadian pattern over the 24-hour period[3]. Topical application of latanoprost reduced IOP and increased outflow facility in the mouse[4]. This IOP response was critically dependant on the Fp receptor indicating the presence of functional Fp receptors in the mouse eye[5]. It is, however, not known whether the FP receptor plays an important role in circadian regulation of intraocular pressure in the mouse. The purpose of this study was to compare 24-hour circadian IOP changes in FP receptor knockout mice with wild type mice that have normal FP receptor expression.
Design: Animal model
Methods: IOP was measured using microneedle cannulation of the anterior chamber in homozygous (FP-/- n=8), heterozygous (FP±, n=14) C57BL/6 background strain mice (FP+/+, n= 11) at 8 am, 2 pm and 8 pm. The investigator was masked to the mouse genotype at the time of the measurement. To confirm any differences in baseline IOP between genotypes, mid-afternoon IOP was measured in a separate population of FP-/- mice (n=8) FP± mice (n=28) and FP+/+ (n=11) wild type litter mates.
Main outcome measure: Circadian IOP variation
Results: There was no significant difference in IOP between genotypes at any of the three time points. Furthermore, there was no significant difference in the magnitude of circadian IOP variation between wildtype (mean±SEM, 1.82 mmHg ± 0.6), FP± mice (2.7mmHg ±0.7) and FP-/- mice (2.7mmHg ± 1.2). Further IOP measurement in a larger population of FP knockouts and wild type littermates confirmed no difference in afternoon IOP.
Conclusions: There was n significant difference in baseline IOP or circadian IOP fluctuation between wild type and FP knockout mice. This indicates that the FP receptor does not play a critical role in circadian IOP regulation.
Supported by NIH grant Ey005990
References:
1. Mukhopadhyay P, Bian L, Yin H, *et al.* Localization of EP(1) and FP receptors in human ocular tissues
by in situ hybridization. Invest Ophthalmol Vis Sci 2001, 42(2):424-428. **2.** Aihara M, Lindsey JD, Weinreb RN. Aqueous humor dynamics in mice. Invest Ophthalmol Vis Sci 2003, 44(12):5168-5173. **3.** Aihara M, Lindsey JD, Weinreb RN. Twenty-four-hour pattern of mouse intraocular pressure. Exp Eye Res 2003, 77(6):681-686. **4.** Crowston JG, Aihara M, Lindsey JD, *et al.* Effect of latanoprost on outflow facility in the mouse. Invest Ophthalmol Vis Sci 2004, 45(7):2240-2245. **5.** Crowston JG, Lindsey JD, Aihara M, *et al.* Effect of latanoprost on intraocular pressure in mice lacking the prostaglandin FP receptor. Invest ophthalmol Vis Sci 2004, 45(10):3555-3559.

Anterior Chamber and – Angle Evaluation

P072 DETECTION OF PATIENTS AT RISK OF ANGLE-CLOSURE USING ANTERIOR SEGMENT OCT

W Nolan[1], JS See[1], TA Aung[2], ZC Ce[3], DS Friedman[4], SD Smith[5], PT Chew[1]
[1]National University Hospital, Singapore, Singpapore, Singapore, [2]Singapore National Eye Centre, Singapore, Singapore, [3]National University of Singapore, Singapore, Singapore, [4]Wilmer Eye Institute, Baltimore, MD, United States of America, [5]Cole Eye Institute, Cleveland, OH, United States of America

Purpose: To compare a new non-contact imaging method, the anterior segment optical coherence tomograph (AS-OCT), with gonioscopy in the detection of occludable angles.
Methods: Patients attending the glaucoma service at the National University Hospital in Singapore were recruited to this preliminary study evaluating a new prototype of the AS-OCT (Carl Zeiss Meditec, Inc, Dublin, CA, USA). All subjects underwent gonioscopy using the Goldmann 2-mirror lens under dim light conditions by a single observer. The angle width was graded according to the Scheie grading system for all four quadrants of the angle in both eyes. A quadrant of the angle was defined as occludable on gonioscopy if trabecular meshwork was not visible without indentation. All subjects underwent imaging in the supine position with the AS-OCT under dark and light conditions by a separate single observer. An image of the nasal, temporal and inferior quadrants was recorded for each eye, and the quadrant was defined as closed if peripheral iris was opposed to the angle anterior to the scleral spur, and defined as narrow if a small slit was visible between the peripheral iris and the angle anterior to the scleral spur.
Results: Preliminary data have been obtained from 54 eyes of 29 patients. In 28 eyes the temporal quadrant of the angle was defined as occludable by gonioscopy. AS-OCT images demonstrated narrow or closed angles in 24 of these eyes (85.7%). In 46 eyes the inferior angle was defined as occludable by gonioscopy of which the AS-OCT imaging identified 40 (87%) as narrow or closed. Of 19 eyes in which the nasal quadrant was defined as occludable the AS-OCT correctly identified 17(89.5%). In total the AS-OCT correctly identified 81/93 (87.1%) occludable angle quadrants as narrow or closed.
Conclusion: This new prototype of the AS-OCT has the advantage of providing a rapid non-contact method of imaging the drainage angle. These preliminary data demonstrate that the device performs well in identifying patients with angle-closure when compared with gonioscopy.

P073 THREE-DIMENSION MEASUREMENTS OF ANTERIOR CHAMBER WITH PENTACAM SCHEIMPFLUG CAMERA IN COMMUNITY EYE SCREENING

L. Xu, L. Zhang, Y. Ma, H. Yang, S. Wang
Beijing Institute of Ophthalmology, Beijing, China

Purpose: To assess the relationship of age and gender with anterior chamber measurements by Pentacam anterior chamber analyzer in the normal population.
Design: Cross-sectional study.
Subjects: In community eye screening, there were eight subgroups divided by age (40~, 50~,60~,70~) and gender. Each subgroup consisted of more than ten cases. Ninety-two subjects aged 40 years or older were consecutive selected. Inclusion criteria were visual acuity>0.8, subjects without glaucoma and cataract surgery. Subjects with central anterior chamber depth (CACD) being less than 2 mm were accepted for further glaucoma examinations in the Tongren Hospital.
Method: Visual acuity, introcular pressure, slit-lamp biomicroscopy, digital fundus photograph with Canon fundus camera and anterior chamber measurement with Pentacam three-dimension anterior chamber analyzer. Three times of anterior chamber measurement in ten cases were performed to assess the reproducibility of Pentacam anterior chamber analyzer. Main outcome: CACD, anterior chamber volume (ACV) and anterior chamber angle (ACA).
Results: The mean variation coefficient of CACD,ACV and ACA measurements were 0.4%, 2.6%, 3.9%, respectively. CACD and ACV measurements were significantly correlated with gender and age. The mean CACD in females was less than that in males (P=0.044), the mean ACV in females was less than that in males (P=0.002). With aging, CACD became shallower, ACV became smaller. ACA had no relationship with gender or age. Eight cases with CACD being less than 2 mm were found in this screening, of two patients with primary angle closure glaucoma and two patients with primary angle closure were identified by comprehensive glaucoma examination.
Conclusions: CACD and ACV measurements with Pentacam anterior chamber analyzer are good at reproducibility. CACD and ACV measurements were correlated with gender and age.
References:
1. Xu L, Zhangl L, Xia C, *et al* . The prevalence and its effective factors of primary angle-closure glaucoma in defined populations of rural and urban in Beijing, China. Zhong Hua Yan Ke Za Zhi, 2005, 41: 8-14. **2.** Salmon JF, Mermoud A, Ivey A, *et al.* The prevalence of primary angle closure glaucoma and open angle glaucoma in Mamre, western Cape, South Africa. Arch Ophthalmol, 1993, 111: 1263- 1269. **3.** Zhao J, Hu Z. Anterior chamber depth measurement in primary angle-closure glaucoma. Zhong Hua Yan Ke Za Zhi, 1985 ,21 :1-5. **4.** Ye T, Yu Q, Peng S, *et al.* Six years follow-up study of primary angle-closure glaucoma patients. Zhong Hua Yan Ke Za Zhi, 1998, 34: 167-1 69. **5.** Devereux JG, Foster P, Baasanhu J, *et al.* Anterior chamber depth measurement as a screening tool for primary angle-closure glaucoma in an east Asian population. Arch Ophthalmol, 2000,118: 257-263. **6.** Friedman DS, Gazzard G, Foster P, *et al.* Ultrasonographic biomicroscopy, Scheimpflug photography, and novel provocative tests in contralateral eyes of Chinese patients initially seen with acute angle closure. Arch Ophthalmol, 2003, 121: 633-642. **7.** Goldsmith JA, Li Y, Chalita MR, *et al.* Anterior chamber width measurement by high-speed optical coherence tomography. Ophthalmology, 2005,112: 238-244.

P074 MORPHOLOGY OF CORNEAL NERVES USING CONFOCAL MICROSCOPY (CONFOSCAN 3) IN THE OPEN ANGLE GLAUCOMA.

L. Arrico[1], S. Donati Saara[2], T. Mascaro Tommaso[2], R. Pucci[2], M.C. Acconcia[2]
[1]University of Rome 'La Sapienza', Rome, Italy, [2]University of Rome 'La Sapienza', Rome, Italy

Introduction: The Confoscan 3 is a new diagnostic tool used to evaluate microscopic and morphological aspects of the cornea *in vivo*. We used the Confoscan 3 (CS3) to value, *in vivo*, the microscopic corneal findings in patients affected with open angle glaucoma (POAG) and ocular hypertension (POH).
Aim of the study: Our study was particularly focused on the stromal corneal nerves morphology in the central area. The general scheme of corneal innervation is described as originating from thick and straight stromal nerve trunks that extend lateral and anteriorly and give rise to plexiform arrangements of progressively thinner nerve fibres at several levels within the stroma.
Methods: We considered 40 consecutive exams executed with the CS3, presenting four complete scans of the entire cornea: 8 patients affected with open angle glaucoma (POAG) under pharmacological treatment with Timololo Maleato 0.5%, since two years; 6 patients with an untreated ocular hypertension (POH) IOP > 21 mmHg; 6 healthy subjects (N). The CS3 software allows us to execute different types of quantitative evaluations on the images stored in memory (cell density, cell area and so on) and gives for all layers: density and size of any structure founded in the different corneal layers (nerves, opacities and so on); absolute and relative depth of the image selected (derived from Z-axis in the Z-curve); reflectivity of each image selected (derived from Y-axis in the Z-curve). A quantitative and qualitative evaluation of the stromal nervous fibres was made in the three groups. It was measured the nervous fibres thickness and valued the morphological aspects , classifying them in normal (N) if presenting a usual aspect or abnormal (AN) if presenting thinned, tortuous and rosary crown aspects. Quantitative measurements were expressed as mean ± SD. Categorical data were presented as absolute frequencies and percentage values. Quantitative data were analysed with Mann-*I*
Results: The mean nervous fibres thickness was 7.39 ± 1.66 mm in the N group, 6.76 ± 1.87 mm in the POH and 5.24 ± 0.77 mm in the POAG. Analysis of the quantitative data showed a statistically significant reduction of the fibres nervous thickness in the POAG group. The nervous fibres resulted thicker both in the POAG *vs* N than in the POAG *vs* POH. Multiple comparisons within the three groups, about the qualitative evaluation, did not evidence any significance, this was probably due to the exiguity of the sample.
Conclusions: The exams performed by the CS3 allows to reveal an anomalous morphology of the stromal nervous fibres in glaucomatous patients undetected by the traditional biomicroscopy. In the POH the reduction of the stromal nervous fibres thickness is present but not statistically significant. This data is probably due to the exiguity of the sample, so it needs further study in a wider population and for a longer period.
References:
1. Oliveira-Soto L. and Efron N. Morphology of corneal nerves using confocal microscopy. Cornea 2001; 20(4): 374-84.

P075 DEVELOPMENT OF A FULLY AUTOMATED PERIPHERAL ANTERIOR CHAMBER DEPTH ANALYZER AND ITS ACCURACY

A. Fukasawa, K. Kashiwagi, E. Shinbayashi, T. Tsumura, S. Tsukahara
University of Yamanashi Hospital, Yamanashi, Japan

Purpose: The objectives of this study are to develop an improved version of the scanning peripheral anterior chamber depth analyzer (SPAC) for measuring anterior chamber depth (ACD) automatically, which is equipped with several programs for improving ACD measurement accuracy, and to investigate its accuracy for measuring ACD.
Materials and methods: The SPAC system consists of a slit lamp microscope that is mounted with a CCD camera and a computer[1]. It scans the ACD from the optical axis to the limbus consecutively without contacting the ocular surface. The improved SPAC system includes a newly installed auto-focusing system and adjustment programs that utilize simultaneously measured data of central corneal thickness (CT) and corneal radius of curvature (CRC). This system is also equipped with an assisting program for differentiating eyes with narrow angle. A dummy eye was used for investigating the measurement accuracy of CT, CRC and ACD.
Results: This system enables automatic measurement of the peripheral ACD by only pressing a button. The SPAC-measured CT, CRC and ACD values were very similar to the theoretical values and their coefficients of variation were less than 1%.
Conclusion: The improved SPAC system can measure ACD easily with high accuracy and reproducibility, and has good potential for screening eyes with narrow angle and evaluating the ACD.
Reference:
1. Kashiwagi K, Kashiwagi F, Toda Y, Osada K, Tsumura T, Tsukahara S. A newly developed peripheral anterior chamber depth analysis system: principle, accuracy, and reproducibility. Br J Ophthalmol. 2004 Aug;88(8):1030-5.

Visual Function

P076 TOWARDS AN OPTIMAL PERIMETRIC STRATEGY FOR PROGRESSION DETECTION IN GLAUCOMA: FROM FIXED-SPACED TO ADAPTIVE INTER-TEST INTERVALS

N.M. Jansonius
University of Groningen Medical Center, Groningen, Netherlands

Purpose: To determine the optimal perimetric strategy for progression detection in glaucoma.
Design: Theoretical cohort study (thought experiment).
Methods: Two perimetric strategies for progression detection were compared by means of a thought experiment in a theoretical cohort of glaucoma patients. In strategy I, visual field testing is performed with fixed-spaced inter-test intervals at a frequency of two tests per year[1-4] . In strategy II, the frequency of visual field testing is set to one test per year as long as the fields are apparently unchanged, whereas as soon as progression is suspected, confirmation or falsification is performed within a short time span. For definite progression, two confirmations of a suspected progression were required[5-8].
Main outcome measures: The time delay between the progression event and the diagnosis of definite progression and the number of visual field tests performed per patient per year.
Results: Average time delay between the actual progression event and the final diagnosis of definite progression was 15 months in the case of strategy I and 6 months in the case of strategy II. Maximum time delays were 18 and 12 months respectively. The frequency of visual field testing was two tests per patient per year for strategy I and 1.45 tests per patient per year for strategy II.
Conclusions: Perimetry in glaucoma can be optimised by postponing the next test in the case of an apparently stable field and accelerating the next test in the case of a suspected progression. This results in an earlier diagnosis, a lower perimetric frequency, and a shorter period of uncertainty for the patient.
References:
1. Smith SD, Katz J, Quigley HA. Analysis of progressive change in automated visual fields in glaucoma. Invest Ophthalmol Vis Sci 1996;37:1419-1428. **2.** Viswanathan AC, Hitchings RA, Fitzke FW. How often do patients need visual field tests? Graefes Arch Clin Exp Ophthalmol 1997;235:563-568. **3.** Gardiner SK, Crabb DP. Frequency of testing for detecting visual field progression. Br J Ophthalmol 2002;86:560-564. **4.** European Glaucoma Society. Terminology and guidelines for glaucoma. 2nd ed. Savona: Dogma; 2003. **5.** AGIS investigators. Advanced glaucoma intervention study 2: visual field test scoring and reliability. Ophthalmology 1994;101: 1445-1455. **6.** Leske MC, Heijl A, Hyman L, Bengtsson B, EMGT group. Early manifest glaucoma trial: design and baseline data. Ophthalmology 1999;106:2144-2153. **7.** Musch DC, Lichter PR, Guire KE, Standardi CL. The collaborative initial glaucoma treatment study: study design, methods, and baseline characteristics of enrolled patients. Ophthalmology 1999;106:653-662. **8.** Jansonius NM. Bayes' theorem applied to perimetric progression detection in glaucoma: from specificity to positive predictive value. Graefes Arch Clin Exp Ophthalmol 2005; in press.

P077 REPRODUCIBILITY OF VISUAL FIELD ENDPOINT CRITERIA BETWEEN SAP-FT AND SAP-SITA TESTING STRATEGIES: THE DIAGNOSTIC INNOVATIONS IN GLAUCOMA STUDY (DIGS)

R.R.A. Bourne[1], K. Jahanbakhsh[2], C. Boden[2], L.M. Zangwill[2], E.M. Hoffmann[2], F.A. Medeiros[2], R.N. Weinreb[2], P.A. Sample[2]
[1]Moorfields Eye Hospital, London, United Kingdom, [2]Hamilton Glaucoma Center UCSD, San Diego, CA, United States of America

Introduction: The clinical management of glaucoma patients often involves a long period of follow-up involving multiple visual field tests, which may involve a change of thresholding strategy.
Aim of the study: To compare the inter-threshold and intra-threshold strategy agreement of commonly used visual field (VF) endpoint criteria for standard automated perimetry (SAP) with the Full Threshold and SITA (Swedish Interactive Thresholding Algorithm) algorithms.
Methods: The inter-strategy group included a randomly selected eye of 173 subjects participants in the Diagnostic Innovations in Glaucoma Study (DIGS) who had performed SAP-FT and SAP-SITA within 3 months (Sequence 'FT&SITA'). Intra-strategy agreement for SAP-FT (Sequence 'FT&FT') was tested for 44 (25.4%) subjects who had performed a FT within a year of the SAP-FT used in the inter-strategy pairing, and for 89 patients (51.4%) who had performed a SAP-SITA within a year before (Sequence 'SITA&SITA'). Criteria tested: Pattern Standard Deviation (PSD)<1%; PSD<5%; Glaucoma Hemifield Test (GHT); four pattern deviation locations (PDP)<5% probability level. Inter-strategy agreement was compared with intra-strategy agreement using kappas (k) for each endpoint criterion.
Results: There were no significant differences in age, mean deviation or proportion with glaucomatous optic neuropathy between participants included in the three testing sequences. We found substantial to almost perfect agreement for the inter and intra-testing strategies. Agreement with GHT was significantly higher (P<0.01) for FT&FT (k=0.94) than FT&SITA (k=0.67), and approached significance (P=0.07) when comparing FT&FT with SITA&SITA (k=0.77). GHT was more likely to be abnormal on the SAP-SITA test than on the SAP-FT. There were no significant agreement differences between the sequences for other endpoints (FT&SITA: For PSD<1%, k=0.82; For PSD<5%, k=0.64; For 4 or more PDP points, k=0.43).
Conclusions: Inter- and intra-strategy agreement were not significantly different for the PSD and PDP criteria. Although the agreement of the GHT result was high between SAP-SITA and SAP-FT, it was significantly lower than between successive SAP-FT tests. This has implications for the clinician when switching strategies, specifically when encountering an abnormal GHT on SAP-SITA following a normal result with SAP-FT.
References:
1. Bengtsson B, Olsson J, Heijl A, Rootzen H. A new generation of algorithms for computerized threshold perimetry, SITA. Acta Ophthalmol Scand 1997;75(4):368-75. **2.** Heijl A. The Humphrey Field Analyzer, construction and concepts. *In* Heijl & Greve (eds.) Documenta Ophthalmol Proc series 42: 77-84. Proceedings of the 6th International Perimetric Society Meeting 1984. Junk Publishers, Dordrecht. 1985. **3.** Haley MJ. The Field Analyzer primer. Allergan Humphrey, San Leandro, CA 1986. **4.** Bengtsson B, Heijl A. SITA Fast, a new rapid perimetric threshold test. Description of methods and evaluation in patients with manifest and suspect glaucoma. Acta Ophthalmol Scand 1998;76(4):431-7. **5.** Bengtsson B, Heijl A. Evaluation of a new perimetric threshold strategy, SITA, in patients with manifest and suspect glaucoma. Acta Ophthalmol Scand 1998;76(3):268-72. **6.** Tsuji A, Inazumi K, Yamamoto T, Kitazawa Y. [Evaluation of the Swedish Interactive Thresholding Algorithm, a new thresholding algorithm, of the Humphrey field analyzer in normal subjects]. Nippon Ganka Gakkai Zasshi 1998;102(6):359-64. **7.** Bengtsson B, Heijl A. Comparing significance and magnitude of glaucomatous visual field defects using the SITA and Full Threshold strategies. Acta Ophthalmol Scand 1999;77(2):143-6. **8.** Johnson CA, Sample PA, Cioffi GA, Liebmann JR, Weinreb RN. Structure and function evaluation (SAFE): I. criteria for glaucomatous visual field loss using standard automated perimetry (SAP) and short wavelength automated perimetry (SWAP). Am J Ophthalmol 2002; 134(2):177-85. **9.** Gordon MO, Kass MA. The Ocular Hypertension Treatment Study: design and baseline description of the participants. Arch Ophthalmol 1999;117(5):573-83. **10.** Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977; 33(1):159-74.

P078 MODELING CHANGES IN THE VARIABILITY OF PERIMETRY RESULTS WITH SENSITIVITY

C.A. Johnson, S.K. Gardiner, S. Demirel
Legacy Health Systems, Portland, OR, United States of America

Purpose: It has been reported that in glaucoma patients the variability of standard automated perimetry results increases as the sensitivity decreases[1-4]. However, the reasons for this change are unclear. This study suggests a possible model for this change in the variability, and demonstrates that it fits patient test-retest data.
Design: Prospective cross-sectional study of patient data, and simulation of modeled data.
Participants: 63 suspected glaucoma patients were tested with standard automated perimetry at 52 test locations per eye, five times within one month (the locations of the 24-2 pattern of the Humphrey Field Analyzer, minus the two points coinciding with the blind spot)[5].
Methods: A model has been produced predicting the increase in variability as sensitivity decreases. Based on this model, a computer program was written to simulate threshold estimates obtained with the Full Threshold testing strategy. The variability at a given sensitivity was then defined as the standard deviation of the differences between individual threshold estimates and the mean of all five estimates at that location for that patient, for all locations whose mean was within 2dB of that sensitivity.
Main outcome measures: The correlation between the sensitivity – variability relationships for patient data and simulated data.
Results: The graph shows the variability for patient data (solid line) and simulated data (black dots) at different sensitivity levels. The correlation between them was 0.987 over the range from 9dB to 33dB. Several factors were found to affect the sensitivity – variability relationship for the simulated data, most notably the rate of sensitivity decline, the percentage of false positives, and the starting position of the test procedure.
Conclusions: The model presented here provides a plausible explanation for the sensitivity – variability relationship in glaucomatous eyes. The simulation could improve upon current methods used to examine the effectiveness of different testing strategies[6,7].
References:
1. Henson D, Chaundry S, Artes P, Faragher E, Ansons A. Response variability in the visual field: comparison of optic neuritis, glaucoma, ocular hypertension, and normal eyes. Invest Ophthalmol Vis Sci 2000;41:417-421. **2.** Chauhan B, House P. Intratest variability in conventional and high-pass resolution perimetry. Ophthalmology 1991;98:79-83. **3.** Weber J, Rau S. The properties of perimetric thresholds in normal and glaucomatous eyes. Ger J Ophthalmol 1992;1:79-85. **4.** Spenceley S, Henson D. Visual field test simulation and error in threshold estimation. Br J Ophthalmol 1996;80:304-308. **5.** Chauhan B, Johnson C. Test-retest variability of frequency-doubling perimetry and conventional perimetry in glaucoma patients and normal subjects. Invest Ophthalmol Vis Sci 1999;40:648-656. **6.** Spry P, Bates A, Johnson C, Chauhan B. Simulation of longitudinal threshold visual field data. Invest Ophthalmol Vis Sci 2000;41:2192-2200. **7.** Gardiner S, Crabb D. Examination of different pointwise linear regression methods for determining visual field progression. Invest Ophthalmol Vis Sci 2002;43:1400-1407.

P079 IMPROVED AUTOMATED PERIMETRY PERFORMANCE FOLLOWING EXPOSURE TO MOZART

N. Kasahara[1], V.M.B. Fiorelli[2], A.S. França[2], R. Cohen[2], M.D. Paolera[2], C. Mandia Jr.[2], G.V. Almeida[2]
[1]Santa Casa de São Paulo, São Paulo, Brazil, [2]Santa Casa de Sao Paulo, São Paulo, Brazil

Introduction: Automated perimetry (AP) is the gold standard method to evaluate visual function in glaucoma patients. The reliability of the exam is dependent upon patient cooperation. Music has been used in Medicine to improve mental skills[1,2]. Mozart in particular, seems to improve the realization of spatial-temporal tasks[3,4].
Aims of the study: to evaluate the performance of young normal subjects naïve to automated perimetry after listening to a Mozart sonata.
Methods: Sixty normal subjects naïve to AP were assigned to one of two groups; the study group (30 subjects) underwent AP (SITA 24-2) immediately after listening to Mozart's Sonata for Two Pianos in D Major and the control group (30 subjects) underwent AP without prior exposure to the music. Fixation loss, false positive and false negative rates, test time, number of points depressed at p<0.05 at total deviation and pattern deviation plots were recorded and compared between the groups.
Results: the study group had significantly less fixation loss, false positive and false negative rates as compared to controls (p<.001).
Conclusion: Listening to Mozart seems to improve AP performance in normal naïve.
References:
1. Formisano R, Vinicola V, Penta F, *et al.* Active music therapy in the rehabilitation of severe brain injured patients during coma recovery. Ann Ist Super Sanita 2001;37:627-30. **2.** Lou MF. The use of music to decrease agitated behaviour of the demented elderly: the state of the science. Scand J Caring Sci 2001;15:165-73. **3.** Rauscher FH, Shaw GL, Ky KN. Listening to Mozart enhances spatial-temporal reasoning: towards a neurophysiological basis. Neurosci Lett 1995; 185:44-7. **4.** Sarnthein J, vonStein A, Rappelsberger P, *et al.* Persistent patterns of brain activity: an EEG coherence study of the positive effect of music on spatial-temporal reasoning. Neurol Res 1997;19:107-16.

P080 THE SENSITIVITY OF SIZE I STIMULUS IN AUTOMATED PERIMETRY FOR DETECTION OF GLAUCOMATOUS VISUAL FIELD DEFECTS. A COMPARATIVE ANALYSIS WITH SHORT WAVELENGTH AUTOMATED PERIMETRY AND SITA

N. Kasahara[1], T.C.L. Mattos[2], R. Cohen[2], M.D. Paolera[2], C. Mandia Jr.[2], G.V. Almeida[2]
[1]Santa Casa de São Paulo, São Paulo, Brazil, [2]Santa Casa de Sao Paulo, São Paulo, Brazil

Introduction: Early diagnosis of glaucoma is essential in order to start early treatment and prevent visual field loss. Short wavelength automated perimetry can predict the development of glaucomatous field loss in up to 5 years[1]. Others authors have evaluated the diagnostic capability of automated perimetry with size I stimulus in detecting early glaucomatous field defect.[2,3].
Aims of the study: To evaluate the sensitivity and specificity of size I stimulus in central 24-2 full threshold automated perimetry (WW-I) for detection of glaucomatous visual field defects and to compare its diagnostic capability with blue-on-yellow perimetry (SWAP) and conventional size III white-on-white automated perimetry with swedish interactive threshold algorithm strategy (SITA).
Methods: Twenty-five normal subjects, 24 patients with early glaucoma and 24 glaucoma suspects underwent visual field testing with SITA 24-4, SWAP 24-2 and WW-I. Sensitivity, specificity and area under the ROC curve were calculated for each test and compared.
Results: WW-I was more sensitive than SWAP and SITA in the detection of early visual field defects. The area under the ROC curve was 0.87 for WW-I, 0.82 for SITA, and 0.79 for SWAP. These differences, however, fail to reach statistical significance.
Conclusion: WW-I has good sensitivity for detection of early glaucomatous visual field defects. It is a good alternative in developing countries, where budgetary issues limit the acquisition of new technologies.
References:
1. Johnson CA, Adams AJ, Cansson EJ, Brandt JD. Blue-on-yellow perimetry can predict the

development of glaucomatous field loss. Arch Ophthalmol 1993;111:645-50. **2.** Zalta AH, Burchfield JC. Detecting early glaucomatous field defects with the size I stimulus and Statpac. Br J Ophthalmol 199;74:289-93. **3.** Yamada K, Osako M, Osako S, *et al.* The effectiveness of detecting early glaucomatous field defect using the size I stimulus. In: Wall W & Mills (eds) Perimetry Update 2000/2001. The Hague: Kugler Publications 2001;51-8.

P081 AUTOMATED PERIMETRY IN PATIENTS WITH PRIMARY CONGENITAL GLAUCOMA

A.J. Betinjane, C.A. Carvalho, J.G.G. Lopes Fo.
University of São Paulo, São Paulo, Brazil

Purpose: Identify and characterize defects in automated perimetry test in patients with primary congenital glaucoma.
Design: Cohort study Participants and controls: Visual fields of 81 eyes (48 patients) including 15 normal eyes were analysed.
Methods: Automated visual fields obtained with Humphrey perimeter[1] and charts of 48 patients (81 eyes) with congenital glaucoma[2,3] were retrospectively analyzed, being 15 normal eyes (group N) and 66 eyes with primary congenital glaucoma (group G). The age of patients[4,5] at the first visual field was: min. = 7 and max. = 35 years. Eyes of group G were grouped in eyes with early or without perimetric changes, characterized by MD > -6 dB (group G I = 41 eyes), and eyes with mild/advanced perimetric defects characterized by MD ≤ -6 dB (group G II = 25 eyes). Patients charts data were analyzed to determine automated visual fields characteristics and some possible correlations[6], according to the used criteria[7].
Main outcome measures: Visual acuity, reliability indices, global indices, GHT report, foveal limiar indice and descriptive visual field defects.
Results: The majority of patients showed good reliability. In group G I, 68% had normal visual fields; 22% showed localized defects and 10% showed general reduction of sensitivity. In group G II, 56% of the visual fields showed general reduction of sensitivity and 44% showed localized defects. The most common localized change was the inferior paracentral scotoma. Eyes with normal visual fields in group G I had foveal limiar and MD values lower than normal eyes. The hemifield test was normal in 68% of eyes in group G I, and was abnormal in 100 % of eyes in group G II.
Conclusions: Automated perimetry can contribute to the initial evaluation and the follow-up of eyes in patients with congenital glaucoma.
References:
1.Choplin, N. T.; Edwards, R. P. Basic principles of visual field interpretation. *In*: Visual field testing with Humphrey field analyzer. 1995;5:69-98 **2.** Betinjane, A. J.; Carvalho, C. A. Refração e biometria ocular no glaucoma congênito. Arq. Bras. Oftalmol. 1986;49:41-46 **3.** Greve, E. L Glaucoma congênito, pigmentar, pseudo exfoliativo, de pressão normal e de ângulo fechado. Rev. Int. Glaucoma. 1999;1:13 **4.** Heijl, A.; BENGTSSON, B. The effect of perimetric experience in patients with glaucoma. Arch. Ophthalmol. 1996;114:19-22 **5.** Tschopp, C.; Safran, A. B.; Laffi, J. L.; Mermoud, C.; Bullinger A.; Viviani, P. Périmétrie statique automatisée chez l'enfent: problemes métodologiques et pratiques. Klin. Monatsbl. Augenheilkd. 1995;206:416-419 **6.** ASMAN, P.; HEIJL, A. Evaluation of methods for automated hemifield analysis in perimetry. Arq. Ophthalmol.1992a;110:820-826 **7.** Hodapp, E.; Parrish, I. I. R. K.; Anderson, D. R. Clinical decisions in glaucoma. St. Louis, The C. V. Mosby. 1993:84-126

P082 EVALUATION OF CORRELATION BETWEEN STATIC PERIMETRY RESULTS AND CHANGES IN ENDOTHELIN-1 PLASMA LEVELS AFTER COLD-PRESSOR TEST IN GLAUCOMA PATIENTS

B. Terelak-Borys[1], A. Piekarniak-Wozniak[1], I. Liberek[1], K. Czechowicz-Janicka[2]
[1]Medical Center of Postgraduate Education, Warsaw, Poland, [2]Institute of Glaucoma, Warsaw, Poland

Purpose: Vasospasm is considered one of the risk factors for glaucomatous damage. It may disturb blood flow autoregulation in the optic nerve head and lead to changes in the visual field. Endothelin-1 (ET-1) is the strongest vasospastic mediator which is involved in the autoregulatory mechanisms.The aim of the study was to evaluate ET-1 plasma levels in basal conditions and after cold-pressor in three groups of subjects: 1. primary open-angle glaucoma patients (POAG), 2. normal-tension glaucoma patients (NTG), 3. healthy persons, and to correlate changes of ET-1 plasma levels with changes in static perimetry results after this test.
Design: experimental study.
Participants: Young subjects not suffering from cardiovascular diseases: 1. primary open-angle glaucoma patients (nine persons); 2. normal-tension glaucoma patients (eight persons); 3. controls (16 persons).
Methods: ET-1 plasma levels were measured in basal condition and after cold-pressor test (immersion of a whole hand in 4 degrees C water for 2 minutes) by radioimmunoassay (Amersham International). Visual field testing was performed by standard automatic perimetry (Octopus 101, Interzeag, G2) in the same conditions. 'Eye-1' was the eye tested immediately after the cold-pressor test and 'Eye-2' was tested later, about 15 min after cold-pressor test. Results from 'Eye-1' and 'Eye-2' were analysed separately. Student *t* test, analysis of variance and Pearson correlations were used for statistics.
Main outcome measures: ET-1 plasma levels – pg/ml, visual field testing – mean sensitivity MS (dB).
Results: Mean basal ET-1 plasma level was significantly lower in NTG group than in POAG group and control group (50,63 pg/ml *vs* 81,39 pg/ml *vs* 91,25 pg/ml). Cold pressor-test resulted in statistically significant increase in mean ET-1 plasma level in all three groups and this increase was significantly higher in NTG group in comparison to POAG group and control group (+43,75 pg/ml *vs* +28,06 pg/ml *vs* +24,97 pg/ml). There were no significant changes in 'Eye-1' MS values in all three groups (control: +0,31 dB, POAG: -0,53 dB, NTG: -0,5 dB). The highest increase in ET-1 plasma level after cold-pressor test in NTG group was accompanied by significant decrease in 'Eye-2' MS value (-1,06 dB *vs* -0,09 dB in control group and -0,27 dB in POAG group). Statistical correlation between changes in ET-1 plasma levels and 'Eye-2' MS value changes after cold-pressor test in this group was not found.
Conclusions: Results of the study indicate that ET-1 may be involved in vasospastic reactions provoked by cold and these reactions seem to be strongest in NTG patients. The results also suggest that vasospastic effects of ET-1 may lead to visual field disturbances in these patients.
References:
1. Cellini M, Possati GL, Profazio V, Sbrocca M. Color doppler imaging and plasma levels of endothelin-1 in low-tension glaucoma. Acta Ophthalmol Scand 1997;224 Suppl1:11-13 **2.** Flammer J. The role of vasospasm in the pathogenesis of glaucoma. *In*: 'Pharmacotherapy in glaucoma.' Verlag Hans Huber, Bern 2000:207-234
3. Gasser P, Flammer J, Guthauser U, Mahler F. Do vasospasm provoke ocular diseases? Angiology 1990; 41: 213-219 **4.** Kaiser HJ, Flammer J, Wenk M, Luscher T. Endothelin-1 plasma levels in normal-tension glaucoma: abnormal response to postural changes. Graefe's Arch Clin Exp Ophthalmol 1995; 233: 484-88 **5.** Sugijama T, Morija S, Oku H, Azuma I. Association of endothelin-1 with normal-tension glaucoma: clinical and fundamental studies. Surv Ophthalmol 1995; 39 Suppl 1: 49-56

P083 ONE YEAR CHANGE IN PERIPHERAL ANTERIOR CHAMBER DEPTH IN PATIENTS WITH GLAUCOMA

T. Tsumura[1], K. Kashiwagi[1], J. Nakayama[2], S. Tsukahara[1]
[1]University of Yamanashi, Yamanashi, Japan, [2]Takagi Seiko, Nakano, Japan

Purpose: Although it is known that aging changes in anterior chamber depth (ACD), there are few reports which investigate ACD change with quantative and longitudinal manner. We recently developed scanning peripheral anterior chamber depth analyzer(SPAC). In this study,we investigated one year change in ACD in patients with glaucoma using SPAC.
Design: prospective study.
Participants:110 glaucoma patients at the glaucoma clinic of Yamanashi University Hospital.
Methods: Patients with glaucoma who visited Yamanashi University Hospital from February 2003 to May 2004 were subject to this study. Their peripheral ACD was prospectively measured at the time of entry and at least at one year later after the entry. Their right eye was chosen, if it met the following conditions: no history of any eye surgeries, no change of medications influencing ACD such as pilocarpine, or phakic eye. Otherwise the left eye was employed. SPAC measured peripheral ACD three times and averaged values were subject to analysis.
Main outcome measure: Anterior chamber depth change.
Results: One-hundred and ten patients were enrolled. Their mean age was 63.8 years old and there were 49 male and 61 female patients. The mean intraocular pressure (IOP) before entry and one year later were 15.5 ± 3.7 and 15.4 ± 3.3mmHg,respectively. Additional eyedrops were prescribed to 13 subjects due to IOP elevation and 25 subjects elevated their IOP 2mmHg or more during one-year follow-up. The ACD was significantly decreased at all the optic axis. The magnitude of ACD change tends to correlate with age and ACD at the entry.
Conclusions: ACD is decreased with aging and its magnitude is emphasized at the peripheral area. The age related change in ACD may effect on IOP control in patients with glaucoma.
References:
1. Chen, H. B., Kashiwagi, K., Yamabayashi, S., Kinoshita, T., Ou, B. and Tsukahara, S. (1998) Anterior chamber angle biometry: quadrant variation, age change and sex difference. Curr. Eye Res. 17, 120-124. **2.** Kashiwagi K, Kashiwagi F, Toda Y, Osada K, Tsumura T, Tsukahara S.A newly developed peripheral anterior chamber depth analysis system: principle, accuracy, and reproducibility.Br J Ophthalmol. 2004 Aug;88(8):1030-5.

P084 COMPARISON OF HUMPHREY® MATRIX 24-2 STANDARD PERIMETRY AND HUMPHREY® FIELD ANALYZER 24-2 SITA-STANDARD PERIMETRY

O.D. Semes
University of Alabama Birmingham, Birmingham, AL, United States of America

Introduction: FDT perimetry was designed to measure the function of the magnocellular (M-cells) retinal ganglion cell pathways.[1] While disagreement exists whether FDT measures M-cell function,[2,3] it correlates well with standard automated perimetry (SAP).[4-7] Matrix uses more and smaller stimulus targets than original FDT to characterize retinal sensitivity.[8,9]
Aim of the study: To compare Humphrey$ Field Analyzer (HFA) 24-2 SITA-standard with Humphrey$ Matrix 24-2 standard in normal subjects.
Methods: Eighty-eight eyes of 44 normal subjects had HFA 24-2 SITA-standard performed at an initial visit and four weeks later had Matrix performed. Reliability indices, MD, PSD, size and depth of defect, test time, and GHT message were compared.
Results: Mean MD was -2.51 ± 1.8 and-1.81 ± 3.5 (p = 0.3197) and mean PSD was 1.74 ± 0.8 and 2.85 ± 0.8 (p < 0.0001) for HFA and Matrix, respectively. On pattern deviation significance plots, mean number of points at the <5% probability level was 2.73 ± 2.2 and 2.07± 2.1 (p = 0.0310), for HFA and Matrix, respectively. MD, number of points at the <2%, <1%, and <0.5% probability levels; percent fixation losses (%FL), false positives (%FP), and negatives (%FN), as well as test time did not differ significantly. The agreement measurement for GHT message 0.28.
Conclusions: The Matrix measured a significantly higher PSD, but significantly fewer <5% probability points. There was also poor correlation between the two instruments on the GHT message consistency. However, many of the parameters measured did not vary significantly between the two instruments. The different stimulus used to measure threshold visual field may account for observed differences and indicate a need to re-establish baseline when changing from one strategy to the other.
References:
1. Maddess T, Henry GH. Performance of nonlinear visual units in ocular hypertension and glaucoma. Clin Vis Sci 1992;7: 371-83. **2.** Anderson AJ, Johnson CA. Mechanisms isolated by frequency-doubling technology perimetry. Invest Ophthalmol Vis Sci 2002;43: 398-401. **3.** Martin L, Wanger P, Vancea L, *et al.* Concordance of high-pass resolution perimetry and frequency-doubling technology perimetry results in glaucoma: no support for selective ganglion cell damage. J Glaucoma 2003;12: 40-44. **4.** Bowd C, Zangwill LM, Bery CC, *et al.* Detecting early glaucoma by assessment of retinal nerve fiber layer thickness and visual function. Invest Ophthalmol Vis Sci 2001;42: 1993-2003. **5.** Bayer AU, Maag KP, Erb C. Detection of optic neuropathy in glaucomatous eyes with normal standard visual fields using a test battery of short-wavelength automated perimetry and electroretinography. Ophthalmology 2002;109: 1350-61. **6.** Delgado MF, Nguyen NT, Cox, *et al.* Automated perimetry: a report by the American Academy of Ophthalmology. Ophthalmology 2002;109: 2362-74. **7.** Iester M, Altieri M, Vittone P, *et al.* Detection of glaucomatous visual field defect by nonconventional perimetry. Am J Ophthalmol 2003;135: 35-9. **8.** Spry P, Johnson CA. Within-test variability of frequency-doubling perimetry using a 24-2 test pattern. J Glaucoma 2002; 11: 315-20. **9.** Johnson CA Cioffi GA, Van Buskirk EM. Frequency doubling technology perimetry using a 24-2 stimulus presentation pattern. Optom Vis Sci 1999;76: 571-81.

P085 SENSITIVITY AND SPECIFICITY OF HUMPHREY MATRIX PERIMETRY IN EARLY GLAUCOMA PATIENTS

G.J. Seong, S. Hong, J.H. Lee, H.Y. Yeom, S.J. Ha, Y.J. Hong
Yonsei University College of Medicine, Seoul, South-Korea

Purpose: To investigate the diagnostic accuracy of Humphrey Matrix perimetry, a new type of frequency-doubling technology (FDT) perimetry, in the diagnosis of early glaucoma.
Design: Prospective cross-sectional study.
Participants: One eye each of 56 healthy subjects and 65 patients with primary open-angle glaucoma or normal tension glaucoma was included in this study. Healthy subjects had normal visual fields in standard automated perimetry (SAP), healthy-looking optic discs, and intraocular pressure of ≤ 21mmHg in both eyes. Glaucoma patients had early stage glaucomatous visual field defects in SAP and glaucomatous appearances of the optic disc in at least one eye.
Methods: All subjects underwent Humphrey Matrix perimetry using the full-threshold 30-2 strategy. The receiver operating characteristic (ROC) curves for all available parameters were calculated, and the areas under the curve (AUC) were compared.
Main outcome measures: Sensitivity and specificity of each parameter of Humphrey Matrix Perimetry including mean deviation (MD), pattern standard deviation (PSD), Glaucoma Hemifield test (GHT), and the number of points ≤ 5% or ≤ 1% in pattern deviation plot (PDP).
Results: The AUC for MD, PSD, GHT, the number of points ≤ 5% in PDP, and the number of points ≤ 1% in PDP were 0.80, 0.81, 0.69, 0.99, and 0.95, respectively. For the MD, the sensitivity and specificity with a cutoff point of ≤ -4.89 were 64.6% and 87.5%, respectively. For the PSD, the sensitivity and specificity with a cutoff point of > 3.15 were 84.6% and 66.1%, respectively. For the GHT, the sensitivity and specificity with a cutoff point of 'outside normal limit' were 64.6% and 73.2%, respectively. For the number of points ≤ 5% in PDP, the sensitivity and specificity with a cutoff point of > 0 were 96.9% and 100.0%, respectively. For the number of points ≤ 1% in PDP, the sensitivity and specificity with a cutoff point of > 0 were 89.2% and 100.0%, respectively.
Conclusions: Humphrey Matrix perimetry allowed easy, rapid, and accurate discrimination between healthy subjects and early glaucoma patients. The number of points ≤ 5% in PDP was the best discriminating parameter.

References:
1. Burnstein Y, Ellish NJ, Magbalon M, Higginbotham EJ. Comparison of frequency doubling perimetry with humphrey visual field analysis in a glaucoma practice. Am J Ophthalmol 2000;129: 328-333. **2.** Johnson CA, Samuels SJ. Screening for glaucomatous visual field loss with frequency-doubling perimetry. Invest Ophthalmol Vis Sci 1997;38:413–425. **3.** Kelly DH. Frequency doubling in visual responses. J Opt Soc Am 1996;56:1628–633. **4.** Quigley HA. Identification of glaucoma related visual field abnormality with the screening protocol of frequency-doubling technology. Am J Ophthalmol 1998;125:819–829. **5.** Soliman MA, de Jong LA, Ismaeil AA, van den Berg TJ, de Smet MD. Standard achromatic perimetry, short wavelength automated perimetry, and frequency doubling technology for detection of glaucoma damage. Ophthalmology 2002;109:444-454. **6.** Wadood AC, Azuara-Blanco A, Aspinall P, Taguri A, King AJ. Sensitivity and specificity of frequency-doubling technology, tendency-oriented perimetry, and Humphrey Swedish interactive threshold algorithm-fast perimetry in a glaucoma practice. Am J Ophthalmol 2002;133:327-332.

P086 VISUAL FIELD INDICES BETWEEN HUMPHREY MATRIX VISUAL FIELD INSTRUMENT AND OCTOPUS PERIMETER IN PRIMARY GLAUCOMA

Y.-W. Lan, J.-W. Hsieh, P. Hung
Mackay Memorial Hospital, Taipei, Taiwan

Purpose: To evaluate the correlation between visual field indices by Humphrey Matrix Visual Field Instrument (Matrix) and Octopus perimeter in primary glaucoma.
Design: A comparative consecutive case series.
Participants: Sixty-five eyes of 65 primary glaucomatous patients with characteristic optic nerve changes were recruited. All participants had previous experience with frequency doubling technology (FDT) and Octopus perimetry.
Methods: The visual fields of the study participants were assessed by Matrix 30-2 threshold program and Octopus 1-2-3 G1X program. Matrix performs visual field examination based on FDT which has demonstrated high sensitivity and specificity in detecting glaucomatous visual field defects[1-3]. The 30-2 threshold program in Matrix is modeled after Humphrey Field Analyzer 24-4 full threshold program. It provides threshold, total deviation and pattern deviation plots with probability maps for 69 test points and calculates mean deviation (MD) and pattern standard deviation (PSD).
Main outcome measures: For Matrix, MD (Matrix-MD), PSD (Matrix-PSD), and the points with the probability less than 5% on total deviation and pattern deviation plots were collected. For Octopus, mean defect (Octopus-MD), loss variance (Octopus-LV), corrected loss variance (Octopus-CLV) and the square root of LV (Octopus-SRLV) and CLV (Octopus-SRCLV) were collected. The correlation between these visual field indices by Matrix and Octopus were evaluated using linear regression analysis.
Results: A statistically significant correlation (P<0.001) was found between Matrix-MD and Octopus-MD (r=0.556) as well as Matrix-PSD and Octopus-LV (r=0.816), SRLV (r=0.808), CLV (r=0.812) and SRCLV (r=0.798). Furthermore, the points with P<5% on total deviation plot correlated significantly with Octopus-MD (r=0.520, P<0.001). Significant correlations (P<0.001) were also found between the points with P<5% on pattern deviation plot and Octopus-LV (r=0.661), SRLV (r=0.712), CLV (r=0.656) as well as SRCLV (r=0.713). There was significant difference between Matrix and Octopus for the time needed to perform visual field test (388.9± 38.8 *vs*. 982.2±141.1 seconds).
Conclusions: Humphrey Matrix Visual Field Instrument provides more information about visual field than the traditional frequency doubling perimeter. The results shown by Matrix had good correlation with those by Octopus[4,5].
References:
1. Cello KE, Nelson-Quigg JM, Johnson CA. Frequency doubling technology perimetry for detection of glaucomatous visual field loss. Am J Ophthalmol 2000;129:314-322. **2.** Burnstein Y, Ellish NJ, Magbalon M, *et al.* Comparison of frequency doubling perimetry with Humphrey visual field analysis in glaucoma practice. Am J Ophthalmol 2000;129;328-333. **3.** Trible JR, Schultz RO, Robinson JC, *et al.* Accuracy of glaucoma detection with frequency doubling perimetry. Am J Ophthalmol 2000;129:740-745. **4.** Iester M, Mermoud A, Schnyder C. Frequency doubling technique in patients with ocular hypertension and glaucoma. Correlation with Octopus perimeter indices. Ophthalmology 2000;107:288-294. **5.** Horn FK, Wakili N, Jünemann AM, *et al.* Testing for glaucoma with frequency-doubling perimetry in normals, ocular hypertensives, and glaucoma patients. Graefe's Arch Clin Exp Ophthalmol. 2002;240:658-665.

P087 SCORING AND RELIABILITY OF FREQUENCY DOUBLING PERIMETRY IN EYES WITH GLAUCOMA, CATARACT AND CONTROLS

M.T. Mineva[1], M. Atanassov[2], M.I. Konareva-Kostianeva[2], A.Y. Gerdzhikov[2], P.I. Stroumeliev[3]
[1]Medical University - Plovdiv, Plovdiv, Bulgaria, [2]Medical University, Plovdiv, Bulgaria, [3]Diagnosting Centre 'St.George', Plovdiv, Bulgaria

Purpose: To develop a scoring method for FDT perimetry changes and to apply it for evaluating the visual field and differentiating between three groups: cataract, glaucoma and control.
Design: Prospective cohort study.
Material and methods: Frequency doubling technology perimetry was performed on 30 eyes of 30 consecutive patients with primary open angle glaucoma. The same test was performed on 33 eyes of healthy control subjects and 28 eyes with different stage of cataract. The three groups were matched for age and visual acuity. A score was calculated for each field: 3 pts for a test point depressed bellow 1%, 2 pts. for a point bellow 2%, 1 pt. for a point of bellow 5% and 0 pts. for a normal test point. The score, rates of false positives, fixation losses and exam time were compared between the three groups using ANOVA with post hoc transformation of Bonferroni. Sensitivity and specificity of the visual field score were calculated from receiver operating characteristics (ROC) curve analysis.
Results: The mean score for the control group was 1.61 ± 4.44, for the cataract group: 2.18 ± 3.08, and for the glaucoma group: 8.96 ± 10.39. The difference between the glaucoma group and the other two groups is statistically significant (p<0.001). The sensitivity/specificity ratio is 74 / 76 %, area under the ROC curve 0.80. There is no difference in the rate of false positive answers and fixation losses between the groups. For the glaucoma group the exam time is longer.
Conclusions: The FDT score has a good potential to differentiate between glaucomatous visual field loss and visual impairment caused by cataract and other factors. The test reliability is not affected by the visual field loss.
References:
1. Patel SC, Friedman DS, Varadkar P, Robin AL. Algorithm for interpreting the results of frequency doubling perimetry. Am J Ophthalmol. 2000;129:323-327. **2.** Brusini P, Tosoni C. Staging of functional damage in glaucoma using frequency doubling technology. J Glaucoma. 2003 Oct;12(5):417-26. **3.** Tanna AP, Abraham C, Lai J, Shen J. Impact of cataract on the results of frequency-doubling technology perimetry. Ophthalmology. 2004 Aug;111(8):1504-7. **4.** Horn FK, Wakili N, Junemann AM, Korth M. Testing for glaucoma with frequency-doubling perimetry in normals, ocular hypertensives, and glaucoma patients. Graefes Arch Clin Exp Ophthalmol. 2002 Aug;240(8):658-65. **5.** Turpin A, McKendrick AM, Johnson CA, Vingrys AJ. Performance of efficient test procedures for frequency-doubling technology perimetry in normal and glaucomatous eyes.Invest Ophthalmol Vis Sci. 2002 Mar;43(3):709-15.

P088 EFFECT OF CATARACT EXTRACTION ON FREQUENCY DOUBLING TECHNOLOGY PERIMETRY IN PATIENTS WITH GLAUCOMA

M.A.R. Siddiqui, A. Azuara-Blanco, S. Neville
Aberdeen Royal Infirmary, Aberdeen, United Kingdom

Introduction: Evaluating the results of visual field (VF) tests in patients with co-existing cataract and glaucoma is a common challenge. Previous studies have shown the effect of cataract on standard white-on-white perimetry in patients with glaucomatous VF loss.[1-3] Recent work has demonstrated the effect of cataract on the frequency doubling technology (FDT) perimetry in normal subjects.[4,5]
Purpose: To evaluate the effect of cataract surgery on FDT perimetry in patients with co-existing cataract and glaucoma.
Design: Consecutive prospective cohort study.
Participants: Twenty-seven patients with open-angle glaucoma scheduled for cataract extraction alone or combined with trabeculectomy were enrolled.
Methods: All patients underwent frequency doubling technology (FDT) threshold C-20 visual fields within three months before and three months after surgery.
Main outcome measures: Changes in mean deviation (MD) and pattern standard deviation (PSD) were evaluated. Additionally, changes in best corrected logMAR visual acuity (VA), intraocular pressure (IOP), and number of glaucoma medications were also studied.
Results: Twenty-two patients completed the study. VA improved after surgery, from 0.47 ± 0.19 to 0.12 ± 0.17 (p<0.001). The median number of antiglaucoma medications was 2 before surgery and 0 after surgery. In patients undergoing phaco-trabeculectomy (n=16) the mean IOP before and after surgery was 20.2 ± 5.0 and 15.9 ± 3.7, respectively (p=0.014). The visual indexes changed after cataract extraction: MD improved (from -10.9 ± 4.6dB to -7.0 ± 4.6dB; p<0.001) while PSD worsened (from 7.1 ± 3.5 dB to 8.5 ± 3.8 dB; p=0.001). The extent of VA improvement correlated with the deterioration of PSD score. The Pearson correlation test showed a statistically significant correlation between the postoperative VA improvement and the PSD change (p=0.024, R2 = 0.478). However, the changes of MD and VA were not correlated (p = 0.252, R2 = 0.252).
Conclusion: In patients with co-existing cataract and glaucoma, examined with FDT, MD improved and PSD worsened after cataract surgery. Global indexes of FDT should be interpreted with caution in patients with glaucoma and cataracts.
References:
1. Smith SD, Katz J, Quigley HA. Effect of cataract extraction on the results of automated perimetry in glaucoma. Arch Ophthalmol 1997;115:1515-9. **2.** Chen PP, Budenz DL. The effects of cataract extraction on the visual field of eyes with chronic open-angle glaucoma. Am J Ophthalmol 1998;125:325-33. **3.** Hayashi K, Hayashi H, Nakao F, *et al.* Influence of cataract surgery on automated perimetry in patients with glaucoma. Am J Ophthalmol 2001;132:41-6. **4.** Tanna AP, Abraham C, Lai J, *et al.* Impact of cataract on the results of frequency-doubling technology perimetry. Ophthalmology 2004;111:1504-7. **5.** Kook MS, Yang SJ, Kim S, *et al.* Effect of cataract extraction on frequency doubling technology perimetry. Am J Ophthalmol 2004;138:85-90.

P089 SHORT WAVELENGHT AUTOMATED PERIMETRY IN PATIENTS WITH PRIMARY OPENANGLE GLAUCOMA AND IN HEALTHY PERSONS

A.A. Marinov[1], N.H. Petcova[2]
[1]Medical University Sofia, Sofia, Bulgaria, [2]Medical University, Sofia, Bulgaria

Introduction: Standard Automated Perimetry (SAP) is one of the basic examination tests in patients with Primary Open Angle Glaucoma (POAG). Regarding the principals of standard threshold testing, Short Wavelength Automated Perimetry (SWAP) offers bigger opportunities in detecting early glaucomatous defects.
Purpose: To evaluate the visual field defects of patients with initial Primary Open Angle Glaucoma, and the visual fields of healthy persons using Short Wavelength Automated Perimetry and Standard Automated Perimetry, and to compare the results between these two tests in each group, and between groups.
Methods: A total of 36 eyes (23 patients) with POAG, and 60 healthy eyes (30 subjects), were examined. The mean age was 54.6 ± 9.8 years for the first group, and 43.5 ± 9.5 years for the second group. SAP and SWAP were performed in all subjects, using tests 24-2 SITA Standard and 24-2 B/Y(SWAP) Full Threshold of HFA II 745i (Carl Zeiss, Inc.). Tests of patients with advanced glaucomatous changes (MD < - 6 db. on SAP), best corrected visual acuity less than 1.0, lens opacities, and these with glaucoma surgery performed were excluded from data analyses. Mean values of Mean Deviation (MD) and Pattern Standard Deviation (PSD) for SAP and SWAP were estimated, and the results were compared in each group, and between groups. P values for compared indices were calculated.
Results: Changes in mean values for MD and PSD obtained using SWAP, were markedly greater compared with these, which were obtained using SAP in each of the groups. Mean values for MD and PSD obtained using SWAP were greater in patients with POAG, compared to those of healthy persons.
Conclusion: SWAP is more sensitive in detecting early glaucomatous visual field changes compared to SAP.
References:
1. Dacey DM, Lee BB. The 'blue-on' opponent pathway in primate retina originates from a distinct bistratified ganglion cell type. Nature 1994; 367: 731-734. **2.** Johnson CA, Adams AJ, Casson EJ, Brandt JD. Blue-on-yellow perimetry can predict the development of glaucomatous visual field loss. Arch Ophthalmol. 1993; 111: 645-650. **3.** Johnson CA, Adams AJ, Casson EJ, Brandt JD. Progression of early glaucomatous visual field loss as detected by blue-on yellow and standard wait-on wait perimetry. Arch. Ophthalmol. 111: 651-656, May 1933. **4.** Johnson CA. Selective *versus* nonselective losses in glaucoma. J Glaucoma 1994; 3 (Suppl. 1) S32-S44. **5.** Polo Llorens V, Pinilla Lozano I, Pablo Julvez LE, Larrosa Poves JM, Abecia Martinez E, Cuevas Andres R, Rojo Aragues A, Honrubia Lopez FM. Servicio de Oftalmologia, Hospital Miguel Servet, Zaragoza, Espana [Short-wavelength automated perimetry (SWAP) in subjects with suspected glaucoma (I): assessment of sensitivity thresholds] Arch Soc Esp Oftalmol. 2000 Feb;75(2):91-6. **6.** Sample PA' Taylor JDN,Martinez GA, Lusky M, Weinreb RN. Short-wavelenght colour visual field in glaucoma suspects at risk Am. J. Ophthalmol. Feb. 1993, 115: 225-233. **7.** Sample PA, Weinreb RN. Progressive color visual field loss in glaucoma. Invest. Ophthalmol. Sci., May 1992, 33:6 pp. 2068-71.

P090 THE MEASUREMENT OF COLOR VISION IN EARLY PRIMARY OPEN ANGLE GLAUCOMA

R. Georgiev[1], K.K. Koev[2]
[1]Hospital Alexandrovska Sofia, Sofia, Bulgaria, [2]Univ. Hospital Alexandrovska, Sofia, Bulgaria

Introduction: The authors establish dyschromatopsy in blue axes in glaucoma[1,2,3,4,5].
Purpose: An investigation of interrelationship between early primary open angle glaucoma (POAG) and Color vision defects.
Methods: This study is performed with 24 patients (48 eyes) divided into two groups. The first group of 12 patients (24 eyes) with early POAG and the second control group of 12 patients (24 eyes) were examined with the All-color anomaloscope and HUE-28 color screening test. In all cases both the red-green equation of Rayleigh and the blue-green equation of Morelend were tested and three variables where determined setting range (SR), calculated mid point (CMP) and anomalous quotient (AQ) as compared to the control group.

Results: We established a significant enlargement in the blue-green equation SR in the group with POAG . CMP was significantly shifted toward the short wavelength . The HUE-28 test findings in 16 eyes (66,6%) confirm the predominance of blue-yellow dyshromatopsia axes in POAG. Our results show diminution of the color discriminating sensitivity in the short wavelength half of the visible spectrum and diminution of the blue cone sensitivity in POAG (p<0,001). No significant changes of the Rayleigh equation were detected.
Conclusion: The blue- green color vision testing with the all-anomaloscope –IF-2 can be used as an additional test in the diagnostics of early POAG. The authors establish a predominance of the blue-yellow dyschromatopsia axes in early POAG using HUE-28 test.
References:
1.Yamazaki, Y, Mizuki, K, Hayamizu, F, Tanaka, C, Correlation of blue chromatic macular sensitivity with optic : Yamazaki, Y, Mizuki, K, Hayamizu, F, Tanaka, C, Disc change in early glaucoma patients. Jpn J Ophthalmol. 2002 Jan-Feb; 46(1): 89-94 **2.** Karwatsky, P, Overbury, O, Faubert, J, Red-green chromatic mechanisms in normal aging and glaucomatous observers. Invest Ophthalmol Vis Sci. 2004 Aug; 45(8): 2861-6 **3.** Pearson, P, Swanson, WH, Fellman, RL, Chromatic and achromatic defects in patients with progressing glaucoma. Vision Res. 2001 Apr; 41(9): 1215-27 **4.** Nork, TM, Acquired color vision loss and a possible mechanism of ganglion cell death in glaucoma. Trans Am Ophthalmol Soc. 2000; 98: 331-63 **5**. Malbrel, C, Modification du sens colore chez le glaucomateux suivant l'evolutivite de sa maladie. J Fr Ophtalmol. 1999 Feb; 22(1): 57-60

P091 LONGITUDINAL FOLLOW UP OF OCULAR HYPERTENSIVE PATIENTS WITH A CONFOCAL SCANNING LASER OPHTHALMOSCOPE AND AUTOMATED PERIMETRY
Y. Akar[1], I. Yucel[1], H. Ozer[2]
[1]Akdeniz University School of Medicine, Antalya, Turkey, [2]Akdeniz University School of Medicine, Antalya, Turkey

Introduction: To assess the ability of a confocal scanning laser ophthalmoscope, HRT II (Heidelberg Retina Tomograph, Heidelberg, Germany) to detect early glaucomatous visual field defects.
Methods: A total of 34 ocular hypertensive patients, with a positive family history of glaucoma, were included in the study. Patients with unreliable visual field criteria, those with prior history of ocular surgery, trauma or laser coagulation were excluded from the study. They were followed-up for one year. Complete ocular examination, visual field tests with Humphrey visual field analyser, Model 750, optic nerve head topography using a confocal scanning laser ophthalmoscope, HRT II were performed at baseline, and with three month intervals.
Results: The mean age of the patients (21 females, 13 males) was 34.3 ± 4.5 years (range, 25 to 44 years). Four patients developed glaucomatous visual field defects at first year exam. Cup shape measure, cup volume and the neuroretinal rim area of these patients were noted to be significantly different at 6th month examination (all P values, <0.05). However, disc area and the rest of the optic nerve head topographic parameters were not different during the follow up (all P values, >0.05).
Conclusion: Cup shape measure, cup volume and neuroretinal rim area parameters may potentially herald the onset of glaucomatous visual field defects in patients under high risk of glaucomatous optic neuropathy.

P092 SPATIAL CONTRAST SENSITIVITY DEFECTS FROM EXPERIMENTAL GLAUCOMA
R.S. Harwerth[1], G. Barnes[2], W.F. Holt[2], E.L. Smith[3]
[1]College of Optometry, Houston, TX, United States of America, [2]Alcon Research, Ltd, Fort Worth, TX, United States of America, [3]University of Houston, Houston, TX, United States of America

Purpose: In glaucoma, losses of spatial contrast sensitivity usually precede visual field defects measured by standard clinical perimetry[1-3], but the spatial frequency response properties of visual field defects have not been investigated systematically. The present study was an investigation of contrast sensitivity as a function of spatial frequency in areas of the visual field with depressed sensitivity from experimental glaucoma.
Design: Experimental study. Subjects: Six rhesus monkeys with unilateral experimental glaucoma[4].
Methods: By behavioral methods[5], visual deficits were followed over the time course of experimental glaucoma, using both standard clinical 24-2 visual fields and local measurements of spatial contrast sensitivity. The contrast sensitivity stimuli were horizontally orientated Gabor patches[6] (0.5 octave bandpass) with carrier frequencies of 0.25 – 2.8 c/deg and brief (140 msec) presentation times. The contrast sensitivity data were fitted by an exponential low-pass model to determine values for the height (peak contrast sensitivity) and location (high spatial frequency cut-off) of each function. Contrast sensitivity functions were determined for three locations along the oblique meridian in each visual field quadrant.
Main outcome measures: Spatial contrast sensitivity functions.
Results: The initial contrast sensitivity deficits from glaucoma primarily were at the higher spatial frequencies. These early alterations in contrast sensitivity represented a shift in the location of the contrast sensitivity function to lower spatial frequencies, by as much as a 3 dB reduction in the high spatial frequency cut-off, prior to a reduction in the height of the function. Subsequent, losses for both the height and location of the contrast sensitivity function increased with progression of visual field defects until the depth of high frequency defects became not measurable when the standard perimetry defect exceeded about 12 dB.
Conclusions: Early visual field defects from experimental glaucoma represent selective spatial frequency effects where contrast sensitivity losses at high spatial frequencies precede losses at lower spatial frequencies. Thus, it may be generalized that visual defects from glaucoma represent a progressive spatial filtering, or blurring, with the magnitude of blur increasing during the progression of glaucoma.
Supported by Alcon Research, Ltd and NEI grants RO1 EY01139, RO1 EY03611 and P30 EY07751.
References:
1. Harwerth RS, Smith EL. Contrast sensitivity perimetry in experimental glaucoma. Investigations with degenerate gratings. In: Perimetry Update 1996/1997 M Wall, A Heijl, eds. Kugler Publications, Amsterdam. Pgs 3-12. **2.** Medeiros FA, Sample PA, Weinreb RN. Frequency doubling technology perimetry abnormalities as predictors of glaucomatous visual field loss. Am J Ophthalmol 2004;137:863-871. **3.** Spry PG, Johnson CA, Mansberger SL, Cioffi GA. Psychophysical investigation of ganglion cell loss in early glaucoma. J Glaucoma 2005;14:11-19. **4.** Quigley HA, Hohman RM. Laser energy levels for trabecular meshwork damage in the primate eye. Invest Ophthalmol Vis Sci 1983;24:1505-1307 **5.** Harwerth RS, Smith EL, DeSantis L, Behavioral perimetry in monkeys. Invest Ophthalmol Vis Sci 1993;34:31-40. **6.** Peli E, Arend LE, Young GM, *et al.* Contrast sensitivity to patch stimuli: Effects of spatial bandwidth and temporal presentation. Spatial Vision 1993;7:1-14.

P093 EVALUATING AVAILABLE PARAMETERS FOR IDENTIFYING ABNORMALITY ON FREQUENCY DOUBLING TECHNOLOGY PERIMETRY IN THE DIAGNOSTIC INNOVATIONS IN GLAUCOMA STUDY (DIGS)
P.A. Sample, F.A. Medeiros, J.P. Pascual, C. Boden, L.M. Zangwill, R.R.A. Bourne, C. Bowd, R.N. Weinreb
University of California, San Diego, La Jolla, CA, United States of America

Methods: Visual field examination and other visual function tests: Special methods
Purpose: To evaluate global indices and point-wise criteria for abnormality in Frequency Doubling Technology Perimetry (FDT) N-30, a visual function specific test targeting magnocellular ganglion cells.
Design: Cross-sectional analysis of an observational cohort study.
Participants: One eye of 259 participants was evaluated: 51 normals, 56 ocular hypertensives (OHT), 118 eyes with glaucomatous optic neuropathy (GON) and 34 with progressive GON (PGON), a more stringent criteria to increase probability that glaucoma is present.
Methods: Cross-sectional analysis. Visual fields were not used to classify groups. PGON, the best gold standard currently available for evaluation of functional tests, was documented by evidence of progressive change in optic disc appearance on masked review of simultaneous stereophotographs by two experts.
Main outcome measures: Areas under the ROC for FDT indices and number of defective locations at various probabilities on the pattern and total deviation plots using area under the ROC. ROC results were then used to establish criteria for abnormality at different specificities.
Results: Results are shown in Table 1 for parameters with largest ROC areas. Also shown are sensitivities at set specificities along the ROC curve for the PGON group (Table 2). Within a diagnostic group, no significant differences were found in areas under the ROC for the parameters evaluated.
Conclusions: When comparing visual function specific tests with each other, with standard perimetry, or with measures of optic nerve structure it is important to utilize the best criteria for abnormality for each type of test. It is also important to take into account the trade-off in sensitivity *vs.* specificity for the particular use in question. The FDT N-30 test performs well in separating normal and glaucomatous eyes using a variety of parameters as evidenced by the large area under the ROC.
Support: Grants NEI EY 08208 (PAS) and EY11008 (LMZ)
References:
1. Burnstein Y, Ellish, NJ, Magbalon M, Higginbotham EJ: Comparison of frequency doubling perimetry with humphrey visual field analysis in a glaucoma practice. Am J Ophthalmol, 2000. 129(3): p. 328-33. **2.** Cello KE, Nelson-Quigg JM, Johnson CA: Frequency doubling technology perimetry for detection of glaucomatous visual field loss. Am J Ophthalmol, 2000. 129(3): p. 314-22. **3.** Johnson CA, Samuels SJ: Screening for glaucomatous visual field loss with frequency-doubling perimetry. Invest Ophthalmol Vis Sci, 1997. 38(2): p. 413-25.
Medeiros FA, Sample PA, Weinreb RN: Frequency doubling technology perimetry abnormalities as predictors of glaucomatous visual field loss. Am J Ophthalmol, 2004. 137(5): p. 863-71. **4.** Paczka JA, Friedman DS, Quigley HA, Barron Y, Vitale S: Diagnostic capabilities of frequency-doubling technology, scanning laser polarimetry, and nerve fiber layer photographs to distinguish glauocmatous damage. Am J Ophthalmol, 2001. 131: p. 188-197. **5.** Sample PA, Bosworth CF, Blumenthal EZ, Girkin C, Weinreb RN: Visual function-specific perimetry for indirect comparison of different ganglion cell populations in glaucoma. Invest Ophthalmol Vis Sci, 2000. 41(7): p. 1783-90. **6.** Wu LL, Suzuki Y, Kunimatsu S, Araie M, Iwase A, Tomita G: Frequency doubling technology and confocal scanning ophthalmoscopic optic disc analysis in open-angle glaucoma with hemifield defects. J Glaucoma, 2001. 10(4): p. 256-60.

P094 SENSITIVITY OF A NEW BLUE-ON-YELLOW SPARSE MVEP IN THE DETECTION OF GLAUCOMATOUS VISUAL FIELD DEFECTS.
A. Klistorner, A. Martins, S. Graham, J. Grigg, I. Goldberg, F. Billson
Sydney University, Sydney, Australia

Objective: It is now recognized that a pattern multifocal Visual Evoked Potential (mVEP) using black/white checks can accurately detect glaucomatous visual field defects[1-5]. The test however requires about 8-10 min of recording from each eye to reach acceptable level of signal-to-noise ratio. The aim of this study is to investigate sensitivity of a new short Blue-on-Yellow sparse mVEP (BonY mVEP) protocol in the detection of glaucomatous visual field defects.
Design: Cross-Sectional Study.
Participants: 25 glaucoma patients (age 72±10) with confirmed Humphrey visual field (HVF) defects in at least one eye and 35 age-matched normal subjects (age 68±9)
Method: BonY mVEP used a sparse presentation of blue check patterns on a bright yellow background. Checks were cortically scaled with eccentricity, and larger test zones were used such that there were now 36 zones compared to 58 for black/white mVEP. Multichannel (4) VEPs were recorded monocularly (AccuMap™). Recording duration was only 2 min per eye. All patients also underwent SWAP subjective visual fields.
Main outcome measures: Amplitude of BonY mVEP for each segment of the tested visual field was measured and deviation plot of probability values comparing it with normal database was constructed.
Results: In the 25 glaucoma subjects, 35/50 eyes had abnormal Humphrey visual field (HVF) and 15 fellow eyes had normal fields. In the group of glaucomatous eyes with HVF defects BonY mVEP detected the scotoma in all cases (100%). Of the 15 fellow eyes with normal HVF, 2 eyes (14%) also demonstrated abnormalities on BonY mVEP. Further hemifield analysis of the glaucomatous fields demonstrated high topographic correspondence (88%) between HVF and BonYmVEP with only one HVF defect (nasal step) missed and 11 additional hemifields detected as abnormal by BonY mVEP. For SWAP however, only one additional defect was found while 10 hemifields classified by HVF as abnormal were missed.
Conclusion: Our preliminary findings suggest that BonY mVEP is a viable method for fast objective detection of glaucomatous visual field defects.
References:
1. Klistorner AI, Graham SL, Grigg JR and Billson FA, Multifocal topographic visual evoked potential: improving objective detection of local visual field defects. Invest Ophthalmol Vis Sci, 1998. 39: p. 937-950. **2.** Klistorner A and Graham SL, Objective perimetry in glaucoma. Ophthalmol, 2000. 107: p. 2283-2299. **3.** Graham SL, Klistorner A, Grigg JR and Billson FA, Objective VEP perimetry in glaucoma - Asymmetry analysis to identify early deficits. J Glaucoma, 2000. 9: p. 10-19. **4.** Hood DC, Greenstein VC, Odel JG, *et al.*, Visual field defects and multifocal visual evoked potentials. Arch Ophthalmol, 2002. 120: p. 1672-1681. **5.** Hood DC, Zhang X, Greenstein VC, *et al.*, An interocular comparison of the multifocal VEP: a possible technique for detecting local damage to the optic nerve. Invest Ophthalmol Vis Sci, 2000. 41: p. 1580-7.

P095 PATTERN ELECTRORETINOGRAM IN GLAUCOMA
M.F. Domingues, A. Rocha-Sousa, A. Martins, H. Monteiro, F. Falcão-Reis
S. João, Porto, Portugal

Purpose: To correlate the pattern electroretinogram and Stratus Optical Coherence Tomography (OCT) measurements in normal, ocular hypertension, glaucoma suspects and glaucomatous eyes.
Participants and methods: A total of 357 eyes were selected from a glaucoma clinic at S.João Hospital. Pattern electroretinograms (PERG) were recorded simultaneously from both eyes using skin electrodes; visual fields were monitored with standard automated perimetry (SAP) central 30-2 program; RNFL and rim area was evaluated by OCT; univariate and multivariate statistical analysis between PERG N95 amplitude and other outcome measures was evaluated.
Main outcome measures: PERG N95 amplitude, SAP mean deviation, OCT RNFL thickness, OCT Rim volume.
Results: PERG N95 amplitude values in normal, ocular hypertension, glaucoma suspects and glaucomatous eyes were 2.2 ± 1.3 μV, 2.1 ± 1.2 μV, 1.6 ± 0.9 μV and 1.2 ± 0.8 μV, respectively. More negative SAP mean deviation, thinner RNFL thickness values and lower rim volume results were significantly correlated with lower PERG N95 amplitude measurements (r =0.32 P<0.0001; r =0.32 P<0.0001 and r =0.24 P<0.0001, respectively).

Conclusion: The moderate correlations between PERG abnormalities and risk factors for glaucoma indicate that the PERG may have a predictive potential for the development of glaucoma.
References:
1. Ventura LM, Porciatti V, Ishida K, Feuer WJ, Parrish RK: Pattern electroretinogram abnormality and glaucoma. Ophthalmology. 2005 Jan; 112(1):10-9. **2.** Toffoli G, Vattovani O, Cecchini P, Pastori G, Rinaldi G, Ravalico G: Correlation between the retinal nerve fiber layer thickness and the pattern electroretinogram amplitude. Ophthalmologica. 2002 May-Jun;216(3):159-63. **3.** Parisi V, Manni G, Centofanti M, Gandolfi SA, Olzi D, Bucci MG: Correlation between optical coherence tomography, pattern electroretinogram, and visual evoked potentials in open-angle glaucoma patients. Ophthalmology. 2001 May;108(5):905-12.

P096 APPLICATION OF MULTIFOCAL ELECTRORETINOGRAM IN DIAGNOSING PRIMARY OPEN-ANGLE GLAUCOMA AND OCULAR HYPERTENSION
L. Bednarski[1], K. Przybylska[2], R. Leszczynski[2], A. Wrobel[2], K. Gorski[2]
[1]Silesian School of Medicine, Katowice, Poland, [2]Silesian School of Medicine, Katowice, Poland

Purposes: To investigate application of multifocal electroretinogram, changes of electric potentials of second order kernel to confirm suspicions of primary open angle glaucoma and ocular hypertension
Materials and methods: We examined both eyes of 15 subjects referred for glaucoma investigation (POAG or OHT). Ten patients with advanced glaucomatous cupping of optic nerve head made up the control group. Routine examination was made and additionally Octopus perimetry, Laser Scanning Tomography (TopSS) and Scanning Laser Polarimetry (Gdx) were performed. Second-order kernel of mfERG was measured by Visual Evoked Response Imaging system by EDI.Inc.
Results: Reduction in amplitudes and delays in the latency of inner retinal components were found in the responses of glaucomatous eyes. That can suggest the loss of cells and impairment of their function. The changes of second-order kernel were not univocal. Reduction of amplitude did not correspond to the area of scotoma. We did not succeed in distinguishing changes in second-order kernel in examined, glaucoma-suspected group. We observed changes in response coming from ganglion cells but they were not statistically significant. Patients need to be observed in the future.
Conclusions: Glaucomatous damage is known to affect the ganglion cell axon. In advanced glaucoma changes a remarkable reduction of components is observed in the second-order kernel response. These changes do not appear to be well localized and local waveforms are poorly correlated with local changes in field sensitivity.
The second order kernel analysis is important in measuring the inner retinal activity and is an important factor in detecting the early glaucoma cases, more objective compare to perimetry.

P097 MULTIFOCAL ELECTRORETINOGRAPHIC (MFERG) EVIDENCE FOR PERSISTENT BUT REVERSIBLE OUTER RETINAL INJURY IN CHRONIC OCULAR HYPERTENSION IN NON-HUMAN PRIMATES
T.M Nork, C.B.Y Kim, M.J Lucarelli, L.A. Levin, P. Kaufman, G.A. Heatley, J.N. Verhoeve
University of Wisconsin Medical School, Madison, WI, United States of America

Purpose: To test a hypothesis that outer retinal injury is a persistent feature of chronic experimental ocular hypertension (OHT).
Methods: OHT was produced in eight monkeys (four rhesus and four cynomolgus) by laser scarification of the trabecular meshwork. Two of the animals had had a previous surgical optic nerve transection (ONT, one rhesus and one cynomolgus) in the treated eye. mfERG testing was performed using VERIS Science™ 4.9 for stimulus generation. The display consisted of 103 equal-sized hexagonal elements, which subtended a total of 880 of the visual field. A binary m-sequence (214-1) with 13.33-ms base period was used. The waveforms were digitally filtered into low [<80 Hz, evoked potential (EP)] and high [>80 Hz, oscillatory potential (OP)] frequency components. The root-mean-square (RMS) of the 9-35 ms (N1-P1) portion of the K1 waveform was averaged in 4 rings radiating from the foveal element. The animals had from 0 to 8 baseline tests prior to OHT. Following OHT, the animals were periodically tested with mfERGs for up to 4.4 years. Two of the rhesus monkeys subsequently had their intraocular pressure (IOP) lowered by trabeculectomy.
Results: All of the rhesus (including the animal with a prior ONT) and one of the cynomolgus monkeys showed markedly supranormal K1 N1-P1 EP amplitudes. The supranormality showed no tendency to degrade with time. In some of the animals, supranormal OPs were noted as well. Trabeculectomy reduced the IOP in both rhesus to normal levels. Following trabeculectomy, the rhesus with an intact optic nerve showed recovery of the EPs and OPs to normal levels despite 14 months of OHT. A similar trend (although less pronounced) was observed for the trabeculectomized rhesus with the prior ONT. (This monkey's IOP had been previously elevated for 44 months.)
Conclusions: Supranormality is probably an indication of neuronal injury. Its presence in both the one ONT as well as most intact eyes with OHT suggests that its origin is the outer retina (*e.g.*, photoreceptors and/or bipolar cells). Reversibility following IOP lowering by trabeculectomy is consistent with reversible ischemic injury to the outer retina.
References:
1. Nork TM, Ver Hoeve JN, Poulsen GL, Nickells RW, Davis MD, Weber AJ, Vaegan, Sarks SH, Lemley HL, Millecchia LL. Swelling and loss of photoreceptors in chronic human and experimental glaucomas. Arch Ophthalmol. 2000;118:235-45. **2.** Nork TM, Poulsen GL, Nickells RW, Ver Hoeve JN, Cho NC, Levin LA, Lucarelli MJ. Protection of ganglion cells in experimental glaucoma by retinal laser photocoagulation. Arch Ophthalmol. 2000;118:1242-50. **3.** Frishman LJ, Saszik S, Harwerth RS, Viswanathan S, Li Y, Smith EL, 3rd, Robson JG, Barnes G. Effects of experimental glaucoma in macaques on the multifocal ERG. Multifocal ERG in laser-induced glaucoma. Doc Ophthalmol. 2000;100:231-51. **4.** Raz D, Seeliger MW, Geva AB, Pericot CL, Lambrou GN, Ofri R. The effect of contrast and luminance on mfERG responses in a monkey model of glaucoma. Invest Ophthalmol Vis Sci. 2002;43:2027-35. **5.** Raz D, Perlman I, Pericot CL, Lambrou GN, Ofri R. Functional damage to inner and outer retinal cells in experimental glaucoma. Invest Ophthalmol Vis Sci. 2003;44:3675-84.

Structure

P098 COMPARISON OF DIAGNOSTIC ABILITY OF QUALITATIVE SIGNS AND OPTIC DISC MORPHOLOGIC CHARACTERISTICS BETWEEN PRIMARY ANGLE-CLOSURE GLAUCOMA AND PRIMARY OPEN-ANGLE GLAUCOMA
J.H. Hwang, K.B. Uhm
Hanyang University College of Medicine, Seoul, South-Korea

Purpose: To evaluate the ability of qualitative signs for glaucoma diagnosis, both in single and in combination, to discriminate between eyes with and without glaucomatous visual field damage. Furthermore, we investigate whether the characteristics optic disc change in primary angle-closure glaucoma (PACG) differ from those in primary open-angle glaucoma (POAG).
Design: Cross-sectional study.
Participants and controls: 177 patients with PACG, 184 patients with POAG, and 181 normal subjects.
Methods: Using 20° color polaroid optic disc photographs, we examined 10 qualitative signs.
Main outcome measures: The sensitivity, specificity, and area under receiver operating characteristic (ROC) curve were calculated for individual qualitative sign and combination of qualitative signs.
Results: Rim notches and rim shape alteration were found more frequently in patients with POAG than in patients with PACG. Disc hemorrhage was not found in any eye in PACG group. In the early stage (mean deviation >-6 dB) of PACG and POAG group, the best qualitative sign was rim shape alteration (area under ROC curve: 0.696 for PACG, 0.768 for POAG). The area under ROC curve for the combination of qualitative signs were 0.802 for the early PACG group and 0.918 for the early POAG group.
Conclusions: These results suggest that glaucomatous disc damage was less pronounced in the PACG eyes when compared with POAG eyes with similar visual field damage. A combination of the qualitative signs of optic disc using multiple logistic regression modelling improved diagnostic ability.
Reference:
1. Harper R, Reeves B. The sensitivity and specificity of direct ophthalmoscopic optic disc assessment in screening for glaucoma: a multivariate analysis. Graefe's Arch Clin Exp Ophthalmol 2000;238:949-55. **2.** Jonas JB, Nguyen XN, Naumann GOH. Non-quantitative features in normal and glaucomatous optic discs. Acta Ophthalmol 1989;67:361-6. **3.** Uchida H, Yamamoto T, Tomita G, Kitazawa Y. Peripapillary atrophy in primary angle-closure glaucoma: A comparative study with primary open-angle glaucoma. Am J Ophthalmol 1999;127:121-8. **4.** Mikelberg F, Parfitt C, Swindale N, *et al.* Ability of the Heidelberg Retina Tomograph to detect early glaucomatous visual field loss. J Glaucoma 1995;4:242-7. **5.** Jonas JB, Fernandez MC, Sturmer J. Pattern of glaucomatous neuroretinal rim loss. Ophthalmology 1993;100:63-8.

P099 THE INFLUENCE OF AGE, GENDER, AND REFRACTIVE ERROR ON THE QUALITATIVE SIGNS TO DETECT GLAUCOMATOUS OPTIC NERVE DAMAGE IN NORMAL SUBJECTS
J.H. Hwang, H.K. Sung, J.M. Lee, K.B. Uhm
Hanyang University College of Medicine, Seoul, South-Korea

Purpose: To evaluate the influence of age, gender, and refractive error on the qualitative signs to detect glaucomatous optic nerve damage in normal subjects.
Design: Cross-sectional study.
Participants and controls: 181 eyes of 181 normal subjects.
Methods: We evaluated color optic disc photographs for the presence or absence of 10 qualitative signs: such as rim shape alteration (alteration of ISN'T rule), thinnest rim width outside the temporal sector, rim notch, optic disc hemorrhage, baring of circumlinear vessel, bayonetting of vessel, nasalization of vessel, abnormal large peripapillary atrophy, abnormal form of peripapillary atrophy, and zone beta in 181 eyes of 181 normal subjects.
Main outcome measures: The influence of age, gender, and refractive error on each qualitative sign was analyzed by multiple logistic regression.
Results: Refractive error was related to zone beta (odds ratio = 0.65, 95% confidence interval [CI] = 0.51<"0.82, p = 0.0004) and the frequency of zone beta was higher in myopic eyes. Age was weakly associated with abnormal large peripapillary atrophy (odds ratio = 1.03, 95% CI = 1.01<"1.06, p = 0.02). Whereas gender had no influence on qualitative signs.
Conclusions: The presence of zone beta in normal subject was associated with myopia, which should be taken into account when the presence of zone beta is used as a diagnostic sign of glaucoma.
References:
1. Jonas JB, Nguyen XN, Naumann GOH. Non-quantitative features in normal and glaucomatous optic discs. Acta Ophthalmol 1989;67:361-6. **2.** Jonas JB, Nguyen XN, Gusek GC, Naumann GOH. Parapapillary chorioretinal atrophy in normal and glaucoma eyes. Invest Ophthalmol Vis Sci 1989;30:908-18. **3.** Ramrattan RS, Wolfs RCW, Jonas JB, *et al.* Determinants of optic disc characteristics in a general population. Ophthalmology 1999;106:1588-96. **4.** Vongphanit J, Mitchell P, Wang JJ. Prevalence and progression of myopic retinopathy in an older population. Ophthalmology 2002;109:704-11. **5.** Gozum N, Cakir M, Gucukoglu A, Sezen F. Relationship between retinal lesions and axial length, age and sex in high myopia. Eur J Ophthalmol 1997;7: 277-82. **6.** Curtin BJ, Karlin DB. Axial length measurements and fundus changes of the myopic eye. Am J Ophthalmol 1971;71:42-53.

P100 BIREFRINGENCE OF THE RETINAL NERVE FIBER LAYER IN HEALTHY AND GLAUCOMATOUS EYES
L.M.E. van Koolwijk, K.A. Vermeer, N.J. Reus, H.G. Lemij
The Rotterdam Eye Hospital, Rotterdam, Netherlands

Purpose: Birefringence, *i.e.* retardation per unit thickness, of the retinal nerve fiber layer RNFL[1,2] has been reported to vary with position around the optic nerve head (ONH) in normal eyes[3,4]. We investigated the RNFL birefringence around the ONH in healthy and glaucomatous eyes, to replicate the reported results and also to assess any RNFL birefringence differences in glaucoma.
Design: Cross-sectional case-control study.
Participants and controls: Eight glaucoma patients and eight healthy subjects.
Methods: We measured both eyes of all subjects with scanning laser polarimetry (SLP) with a variable cornea compensator and a bias retarder 5 (GDx ECC, Laser Diagnostic Technologies, San Diego, CA, USA), as well as with optical coherence tomography (Stratus OCT, Carl Zeiss Meditec, Jena, Germany).
Main outcome measures: Retardation (by SLP) and RNFL thickness (by Stratus OCT) were determined along a peripapillary circle with a radius of 1.81 mm. The data of these two imaging modalities were registered (based on blood vessels). Birefringence was calculated as the slope in linear regression analysis of corresponding data points, thus adjusting for any offset in the measuring instruments.
Results: In healthy eyes, birefringence varied with position around the ONH, being higher superotemporally, inferonasally and inferotemporally. Birefringence in glaucomatous eyes did not show such a pattern. The average RNFL birefringence was also significantly lower in glaucomatous eyes than in normal eyes along the peripapillary circle (p=0.01) and most notably in the superotemporal sector (p<0.01) (table).
Conclusions: Peripapillary RNFL birefringence varies with position in normal eyes. In glaucomatous eyes, birefringence is significantly smaller. These results suggest that the RNFL not only thins in glaucoma, but that its physical properties (*i.e.*, birefringence) change. It is therefore possible that SLP detects glaucomatous change without measurable (by Stratus OCT) RNFL thinning.
References:
1. Dreher AW, Reiter K, Weinreb RN. Spatially resolved birefringence of the retinal nerve-fiber layer assessed with a retinal laser ellipsometer. Appl Opt. 1992;31:3730-3735 **2.** Weinreb RN, Dreher AW, Coleman A, *et al.* Histopathologic validation of Fourier-ellipsometry measurements of retinal nerve fiber layer thickness. Arch Ophthalmol. 1990;108:557-560 **3.** Huang X, Bagga H, Greenfield DS, Knighton RW. Variation of peripapillary retinal nerve fiber layer birefringence in normal human subjects. Invest Ophthalmol Vis Sci. 2004;45:3073-3080 **4.** Cence B, Chen TC, Park BH, *et al.* Thickness and birefringence of healthy retinal nerve fiber layer tissue measured with polarization-sensitive optical coherence tomography. Invest Ophthalmol Vis Sci. 2004;45:2606-2612 **5.** Reus NJ, Zhou Q, Lemij HG. Enhanced imaging algorithm for scanning laser polarimetry with variable corneal compensation. Invest Ophthalmol Vis Sci, in revision.

P101 GDX-VCC ABILITY IN DISCRIMINATING HEALTHY SUBJECTS FROM GLAUCOMATOUS PATIENTS WITH EARLY VISUAL FIELD LOSS
S. Da Pozzo, P. Iacono, R. Marchesan, M. Fuser, O. Vattovani, G. Ravalico
Eye Clinic Trieste University, Trieste, Italy

Purpose: to evaluate diagnostic ability of scanning laser polarimeter with variable corneal compensation (GDx-VCC) in separating normal from glaucomatous eyes with early visual field loss.
Design: observational cross-sectional study.
Participants: 62 healthy and 48 glaucomatous, age-matched subjects with early visual field loss (average MD: -1.74dB ± 1.69),one classified on the basis of achromatic automated perimetry (AAP).
Methods: All subjects underwent a complete ophthalmological evaluation and AAP with 24-2 program, SITA standard strategy. One eye from each subject was included. All glaucomatous eyes had reproducible defects on AAP with either glaucoma hemifield test outside normal limits or pattern standard deviation (PSD) outside 95% confidence limits. All subjects underwent SLP with commercially available version of GDx-VCC.
Main outcome measures: Mean deviation (MD), PSD and GDx-VCC parameters in the 2 groups were compared on *t*-test. Area under the ROC curve and sensitivities at predetermined specificity (≥80% and ≥95%) were calculated for all GDx-VCC parameters. The best performing parameter was evaluated also by positive, negative and interval likelihood ratios (LR).
Results: The two groups were significantly different for MD, PSD and 10 out of 14 GDx-VCC parameters (p<0.001). The best performing parameter was Nerve Fiber Indicator (NFI), whose area under ROC curve was 0.870 (SE 0.034), followed by Superior Average (0.817, SE 0.041) and Normalized Superior Area (0.816, SE 0.043). At specificity ≥80% and ≥95%, NFI sensitivity was 80.2% and 60.4%, respectively. Positive LR was 11.9 (95% CI: 3.8-36.7) at a cut-off value of 29, whereas negative LR was 0.07 (95% CI: 0.01-0.46) at a cut-off value of 19. Interval LR analysis showed large effect on post-test probability for NFI values ≤18 or ≥31.
Conclusions: In a sample of eyes with early visual field loss, GDx-VCC showed a moderate-to-good discriminating ability.2-5 NFI was the best performing parameter, but a significant portion of glaucomatous eyes (21, 43.8%) had NFI <30. This suggests that algorithm for NFI calculation need some refinement when eyes with early visual field loss are evaluated. Improvement may derive from analysis of smaller sectors of superior and inferior regions.
References:
1. Hodapp E, Parrish RK II, Anderson DR Clinical decisions in glaucoma. St.Louis 1993: Mosby-Year Book:52-61 **2.** Weinreb RN, Bowd C, Zangwill LM Glaucoma detection using scanning laser polarimetry with variable corneal polarization compensation. Arch Ophthalmol 2002;120,218-224. **3.** Medeiros FA, Zangwill LM, Bowd C, Weinreb RN Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and Stratus OCT optical coherence tomography for the detection of glaucoma. Arch Ophthalmol 2004;122,827-837 **4.** Reus NJ, Lemij HG Diagnostic accuracy of the GDx VCC for glaucoma. Ophthalmology 2004; 111,1860-1865 **5.** Reus NJ, Colen TP, Lemij HG Visualization of localized retinal nerve fiber layer defects with the GDx with individualized and with fixed compensation of anterior segment birefringence. Ophthalmology 2003;110,1512-1516

P102 THE EFFECT OF ATYPICAL PATTERN OF RETARDATION ON GDX-VCC DIAGNOSTIC ABILITY IN GLAUCOMATOUS EYES
S. Da Pozzo, R. Marchesan, O. Vattovani, T. Canziani, G. Ravalico
Eye Clinic Trieste University, Trieste, Italy

Purpose: To assess the effect of atypical pattern of retardation (APR) on peripapillary retinal nerve fiber layer (RNFL) measurements made by scanning laser polarimetry with variable corneal compensation (GDx-VCC).
Design: Observational, cross-sectional study.
Participants: Thirty glaucomatous eyes (mean MD:-6.4 ± 4.8) with reproducible defect on standard automated perimetry (SAP) and APR on GDx-VCC retardation map. Control groups were made by 34 glaucomatous, age- and severity-matched eyes (mean MD:-7.0 ± 5.3) with normal pattern of retardation (NPR), and 36 healthy subjects. One eye from each patient was included.
Methods: A reproducible defect on SAP (Humphrey Field Analyzer, 24-2 program, SITA strategy) had either glaucoma hemifield test outside normal limits or pattern standard deviation outside 95% confidence limits. RNFL was scanned by commercial version of GDx-VCC (LDT, software 5.3.4). APR was identified by areas of abnormally 'thick' RNFL in nasal and/or temporal quadrant at morphologic examination of GDx-VCC printout retardation map.
Main outcome measures: GDx-VCC parameters mean values (±SD) in the two groups of glaucomatous eyes were compared with healthy eyes' corresponding values (Mann-Whitney U-test). Area under receiver operating characteristic (AUROC) curves were generated for both groups to assess the effect of APR on GDx-VCC parameters diagnostic ability with respect to healthy eyes.
Results: Healthy and glaucomatous eyes with NPR were significantly different on all 14 parameters. On the contrary, four thickness parameters (TSNIT average, Inferior Average and Maximum, Superior Maximum) could not separate healthy from glaucomatous eyes with APR. AUROC were ≥0.9 for nine parameters when glaucomatous eyes with NPR were considered. An AUROC ≥0.85 appeared for only four parameters (Inferior and Superior Ratio, NFI, Max modulation) when glaucomatous eyes with APR were examined.
Conclusion: APR may significantly alter GDx-VCC evaluation of RNFL causing overestimation of some thickness parameter. These findings justify the choice to eliminate these eyes from clinical studies. When GDx-VCC printout of glaucomatous eyes with APR is evaluated in daily clinical practice, it is proper to consider only ratios, modulation parameters and NFI.
References:
1. Reus NJ, Lemij HG Diagnostic accuracy of the GDx VCC for glaucoma. Ophthalmology 2004;111:1860-1865 **2.** Medeiros FA, Zangwill LM, Bowd C, Weinreb RN Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and Stratus OCT optical coherence tomography for the detection of glaucoma. Arch Ophthalmol 2004;122:827-837 **3.** Burns SA, Elsner AE, Mellem-Kairala MB, Simmons RB Improved contrast of subretinal structures using polarization analysis. Invest Ophthalmol Vis Sci 2003; 44, 4061-4068 **4.** Weinreb RN, Bowd C, Zangwill LM Glaucoma detection using scanning laser polarimetry with variable corneal polarization compensation. Arch Ophthalmol 2002;120:218-224. **5.** Bagga H, Greenfield DS, Feuer WJ Quantitative assessment of atypical birefringence images using scanning laser polarimetry with variable corneal compensation. Am J Ophthalmol 2005;139:437-446

P103 HRT II TOPOGRAPHIC CRITERIA OF THE OPTIC NERVE HEAD IN NORMAL AND GLAUCOMA PATIENTS
V. Kuroyedov[1], S.Yu. Golubev[2], L.A. Vasilevich[3]
[1]Mandryka 2nd Central Military Hospital, Moscow, Russian Federation, [2]State Institute of Improvement, Moscow, Russian Federation, [3]Burdenko Main Military Hospital, Moscow, Russian Federation

Purpose: To estimate of topographic parameters of optic nerve head in healthy patients and patients with glaucoma of different age groups.
Methods: A total of 800 normal and 920 glaucoma subjects were tested. The patients were sorted for six age groups: up to 30 years, from 31 to 40 years, from 41 to 50 years, from 51 to 60 years, from 61 to 70 years, from 71 to 80 years. Topographic measurements of the optic disc were acquired using the Heidelberg Retina Tomograph II. The topographic parameters analyzed were disc area (DA), mean cup depth (MCD), cup area (CA), rim area (RA), mean RNFL thickness (RNFL).
Results: There was revealed decreasing of DA in normal patients: from 2,0848 mm^2 (age group up to 30 years); 2,0717 mm^2 (age group 31-40); 2,0189 mm^2 (age group 41-50); 2,0246 mm^2 (age group 51-60d); 1,9114 mm^2 (age group 61-70) to 1,792 mm^2 (age group 71-80). With glaucoma patients it was revealed that DA was decreased at first from 2,613 mm^2 to 2,039 mm^2, and then it was enlarged from 2,099 mm^2 to 2,241 mm^2. At that mean MCD in normal and glaucoma patients was 0,2254 and 0,5793 (mm); 0,2315 and 0,3075 (mm); 0,2206 and 0,2691 (mm); 0,1565 and 0,2222 (mm); 0,1219 and 0,2433 (mm); 0,0974 and 0,1738 (mm) accordingly. Mean CA was 0,5071 and 2,077 (mm^2); 0,5591 and 0,8989 (mm^2); 0,4141 and 0,7322 (mm^2); 0,3053 and 0,5863 (mm^2); 0,1613 and 0,7564 (mm^2); 0,0833 and 0,9962 (mm^2) accordingly. RA was 1,5387 and 0,5537 (mm^2); 1,5041 and 1,2739 (mm^2); 1,605 and 1,4218(mm^2); 1,7194 and 1,4518 (mm^2); 1,7484 and 1,3183(mm^2); 1,7081 and 1,3649 (mm^2). Mean RNFL thickness was 0,2479 and 0,1906(mm^2); 0,2595 and 0,243 (mm^2); 0,2907 and 0,2361(mm^2); 0,2669 and 0,2073(mm^2); 0,2636 and 0,174 (mm^2).
Conclusions: We found decreasing of DA, MCD and CA in normal patients and increasing DA, MCD and CA in glaucoma patients with age (P < 0.05). Also, there was revealed dependence of decrease of RA and mean RNFL thickness in glaucoma patients with age (P < 0.003).

P104 EVALUATION OF THE MOORFIELDS REGRESSION ANALYSIS AND TWO DISCRIMINATE FUNCTIONS USING THE HEIDELBERG RETINAL TOMOGRAPH II IN DIFFERENT OPTIC DISC SIZES
M. Fingeret
Dept. of Veterans Affairs Medical Center, Hewlett, United States of America

Introduction: Optic nerve/ retinal nerve fiber layer (RNFL) analysis has become important components in the evaluation of the glaucoma/glaucoma suspect. One instrument, the Heidelberg Retinal Tomograph II (HRT II), is a confocal scanning laser ophthalmoscope that provides topographic information for the optic nerve. The HRT II has several statistical analytical tools available in the standard software, including Moorfields Regression Analysis (MRA) and FSM and RB discriminate functions. The discriminate function tools use different parameters in a weighted manner to provide a statistical summary of whether the optic nerve is normal. MRA evaluates the rim area, taking into account optic disc size, to determine if it is within a statistically normal range.
Aim of the study: This study evaluates how the MRA and two discriminate functions (FSM, RB) perform in eyes with different optic disc sizes.
Methods: 37 individuals (73 eyes) with glaucoma and 24 normals (47 eyes) were recruited. Three scans were performed with the mean image used. Each image needed to have a standard deviation < 25um. Two groups were evaluated: individuals free of eye disease (normals) and those with glaucoma. Each normal individual had a dilated fundus exam, full Humphrey 24-2 SITA Standard visual field and IOP under 22 mm Hg. Individuals with glaucoma had an optic neuropathy (thin neuroretinal rim, enlarged cupping, retinal nerve fiber layer loss) and visual field damage as seen on a Humphrey 24-2 SITA Standard visual field.
Results: The results for all optic disc sizes are seen in table 1. When evaluating all optic disc sizes, the MRA showed a sensitivity of 69% and specificity of 79%. The FSM and RB discriminate function showed a sensitivity of 73% and 44% with specificity of 63% and 99%. Results based upon optic disc size are seen in table 2.
Conclusion: There is a trade-off between sensitivity and specificity that differs with the type of analysis performed. The MRA, when borderline results were considered outside normal limits, shows the most balance along with the FSM discriminate function. The MRA, when borderline is considered normal, has high specificity but low sensitivity. The RB analysis has low sensitivity with high specificity. When the analysis is broken down by optic disc size, there is also a trade-off between sensitivity and specificity. In general the RB analysis has low sensitivity and high specificity for all disc sizes. For small optic discs, MRA has low sensitivity with high specificity while FSM has high sensitivity and low specificity. For medium disc sizes, MRA and FSM were more accurate with good sensitivity and specificity. For large discs, MRA has good sensitivity and low specificity (if borderline is considered abnormal). If borderline is considered normal, MRA still has high specificity. The analytical tools available for the HRT II perform differently depending on optic disc size. The clinician should bear this in mind as the data is evaluated.
References:
1. Mikelberg *et al.* FSM analysis J Glaucoma 1995;4:242-247. **2.** Wollstein G, Garway-Heath DF, Hitchings RA Identification of early glaucoma cases with the scanning laser ophthalmoscope. Ophthalmology 1998;105:1557-1563

P105 DIAGNOSTIC ABILITY OF ANALYSIS TOOLS FOR DETECTION OF GLAUCOMA WITH THE CONFOCAL SCANNING LASER TOMOGRAPH (HEIDELBERG RETINA TOMOGRAPH II)
J.M. Larrosa, V. Polo, A. Ferras, V. Pueyo, A. Sanchez-Cano, F.M. Honrubia
Hospital Universitario Miguel Servet, Zaragoza, Spain

Aim of the study: To evaluate the performance of logistic regression formulas (LRGs) elaborated from our autoctone population (Zaragoza, Spain) by means of multivariate analysis of the topographic parameters obtained by Heidelberg Retina Tomograph to detect glaucomatous damage.
Methods: 101 normal eyes, 247 ocular hypertensive eyes and 102 glaucomatous eyes were included in study. Subjects were classified into the three groups based on intraocular pressure and standard automated perimetry (SAP) performance. The receiver operating characteristic curves (ROC) and the area under curves (AUC) were performed to assess the diagnostic value of the four multivariate formulas elaborated from our autoctone population to discriminate the presence of glaucomatous damage.
Results: There were significant differences between normal and glaucomatous eyes in all the LRGs (p<0.05). Ocular hypertensive eyes showed a pronounced overlap of the LRG results with respect to control and glaucoma groups. Nevertheless, when ocular hypertensives were segregated into different subsets of eyes based on clinical evaluation of the optic nerve head or short-wavelength automatic perimetry performance, the LRG ability to discriminate the presence of structural glaucoma damage significantly improved in this population. At a fixed specificity of 90% all the LRGs showed a sensitivity around 65% with AUCs greater than 0,84. A significant correlation was found between LRGs and the global indices of SAP.
Conclusions: The use of HRT analytic tools improves the diagnostic ability of HRT to discriminate healthy subjects from glaucoma patients. The use of alternative tools based on normative databases of autoctone population also improves the value of these diagnostic tools

P106 EVALUATION OF GLAUCOMATOUS DAMAGE ON RETINAL NERVE FIBER LAYER PARAMETERS MEASURED BY GDX VCC SCANNING LASER POLARIMETER
F.M. Honrubia, V. Polo, J.M. Larrosa, A. Ferras, L.E. Pablo, C. Mayoral
Hospital Universitario Miguel Servet, Zaragoza, Spain

Aim of the study: To evaluate and compare the retinal nerve fiber layer (RNFL) parameters measured by GDx Nerve Fiber Analyzer (GDx VCC) in normal eyes, ocular hypertensives, glaucoma suspects and glaucomatous eyes.
Methods: A total of 39 normal subjects, 123 ocular hypertensive, 38 glaucoma suspects and 47 glaucomatous patients were included in the study. Subject eyes were classified into the four groups of study based on intraocular pressure, stereoscopic optic disc photographs and standard automated perimetry (SAP). Every patient underwent complete ophthalmic examination including RNFL evaluation by means of the commercially available scanning laser polarimeter (GDx VCC; software version 5.0.1; Laser Diagnostic Technologies, Inc).
Results: There were statistically significant differences between normal eyes, ocular hyper-

tensives, glaucoma suspects and glaucomatous eyes in all the RNFL measurements (p<0.05). Among normal eyes, ocular hypertensives and glaucoma suspected eyes there were not significant differences. In glaucomatous eyes the GDx VCC Nerve Fiber Index -NFI- showed the largest area under curve (0,846) in the ROC analysis. The sensitivity of this parameter was 60% at a fixed specificity of 90%. In the glaucoma suspects group, the best RNFL parameter to detect glaucomatous damage (at a given specificity of 90%) was also the NFI (sensitivity 31%) with an area under curve of 0,714.
Conclusions: Quantitative RNFL measurements by means of scanning laser polarimeter (GDx VCC) showed differences between normal, ocular hypertensive eyes, glaucoma suspected and glaucomatous eyes. The RNFL parameters, mainly the Nerve Fiber Index -NFI- are useful to discriminate glaucomatous damage

P107 DIAGNOSTIC VALUE OF THE STRATUS OCT OPTICAL COHERENCE TOMOGRAPH, HEIDELBERG RETINA TOMOGRAPH (HRT II) AND GDX VCC SCANNING LASER POLARIMETER TO DETECT STRUCTURAL DAMAGE IN GLAUCOMATOUS EYES

V. Polo, A. Ferras, J.M. Larrosa, V. Pueyo, A. Sanchez-Cano, F.M. Honrubia
Hospital Universitario Miguel Servet, Zaragoza, Spain

Aim of the study: To compare the diagnostic capacity to discriminate between normal and glaucomatous eyes of different optical imaging devices, the Optical Coherence Tomography (OCT), the Heidelberg Retina Tomograph (HRT), and the GDx Nerve Fiber Analyzer (GDx VCC).
Methods: A total of 39 normal subjects and 47 glaucomatous patients were included in the study. Subject eyes were classified into the diagnostic groups based on intraocular pressure and standard automated perimetry (SAP). Every patient underwent complete ophthalmic examination including GDx VCC, HRT II and Stratus OCT 3000 evaluation. The receiver operating characteristic curves (ROC) were plotted to obtain the diagnostic value (sensitivities at fixed specificities -80% and 90%-) and the area under curves (AUC) of the different structural parameters assessed by the optical imaging devices.
Results: In glaucomatous eyes the best parameters from each device were the GDx VCC Nerve Fiber Index -NFI- (AUC=0,846), the OCT inferior retinal quadrant (AUC=0,921) and the HRT linear discriminant function FSM (AUC=0,870). No statistically significant differences were found between the AUCs for these parameters. Nevertheless, at a fixed specificity of 90% the OCT inferior retinal and the HRT FSM function showed significant better sensitivity (79,2% and 75%, respectively) than the GDx VCC NFI (60%).
Conclusions: Several structural parameters measured by the optical imaging devices of this study are useful to discriminate glaucomatous damage with high diagnostic abilities. Nevertheless, the best OCT and HRT parameters showed higher sensitivities than the best GDx VCC parameters
References:
1. Medeiros FA, Zangwill LM, Bowd C, Weinreb RN. Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and stratus OCT optical coherence tomograph for the detection of glaucoma. Arch Ophthalmol. 2004 Jun;122(6):827-37. **2.** Zangwill LM, Bowd C, Berry CC, Williams J, Blumenthal EZ, Sanchez-Galeana CA, Vasile C, Weinreb RN. Discriminating between normal and glaucomatous eyes using the Heidelberg Retina Tomograph, GDx Nerve Fiber Analyzer, and Optical Coherence Tomograph. Arch Ophthalmol. 2001 Jul;119(7):985-93.

P108 COMPARISON OF RETINAL NERVE FIBER LAYER MEASUREMENTS USING DIFFERENT SCAN DIAMETERS ON THE OCT AND CORRELATION WITH GDXVCC PARAMETERS

T. Dada, P. Garg, R. Sihota, R. Muralidhar, P. Sony, V. Gupta
Dr Rajendra Prasad Centre for Ophthalmic, New Delhi, India

Purpose: Evaluation of retinal nerve fiber layer (RNFL) thickness with optical coherence tomography (OCT) using four scan diameters and correlation with scanning laser polarimetry (GDXVCC).
Design: Cross-sectional study.
Participants: Fifty-eight eyes of fifty eight patients comprising of 33 patients with early primary open angle glaucoma and 25 healthy, age matched controls.
Methods: Measurements of RNFL thickness on OCT3 were performed with standard fast retinal nerve fiber layer (1.73mm radius) scan along with three additional circular scans (1.2, 1.4 and 1.6 mm radius) centered onto to the optic disc. Thickness measurements with GDXVCC were performed along a standard 0.4mm band with an inner diameter of 2.4mm and outer diameter of 3.2mm also centered on to the optic disc.
Main outcome measures: The Average Overall NFL thickness, Average Superior thickness and Average Inferior thickness on OCT was compared with TSNIT average, Superior average and Inferior average on GDxVCC.
Results: The average retinal nerve fiber layer thickness measured with OCT3 was, 109.02 ± 14µ, 107.1 ± 712µ, 95.2. ± 12µ, and 94.01 ± 7.5µ, with scan radius of 1.2mm, 1.4mm, 1.6mm, and 1.73mm respectively, and with GDx-VCC it was 53.8 ± 4.7µ. All the three measured parameters showed a significant positive correlation when measurements of OCT3 and GDXVCC were compared. Highest degree of correlation was observed with a circular scan of radius 1.73 on OCT3 and all 3 parameters of GDx VCC (r= 0.5 TSNIT av, p=0.001, r= 0.6 Sup Av, p<0.001, r =0.49 Inf Av, p=0.001) .
Conclusion: The absolute values of retinal nerve fiber layer thickness vary with the imaging modality used[1-4] and also with the scan diameter on OCT. The measurements on OCT and GDXVCC show a high degree of correlation , with a maximum amongst fast RNFL (1.73mm) Scan on OCT and GDx VCC NFL thickness parameters.
References:
1. Lleo-Perez A, Ortuno-Soto A, Rahhal MS, Martinez-Soriano F, Sanchis-Gimeno JA. Intraobserver reproducibility of retinal nerve fiber layer measurements using scanning laser polarimetry and optical coherence tomography in normal and ocular hypertensive subjects.Eur J Ophthalmol. 2004 Nov-Dec;14(6):523-30. **2.** Huang XR, Bagga H, Greenfield DS, Knighton RW. Variation of peripapillary retinal nerve fiber layer birefringence in normal human subjects.Invest Ophthalmol Vis Sci. 2004 Sep;45(9):3073-80. **3.** Essock EA, Sinai MJ, Bowd C, Zangwill LM, Weinreb RN. Fourier analysis of optical coherence tomography and scanning laser polarimetry retinal nerve fiber layer measurements in the diagnosis of glaucoma. Arch Ophthalmol. 2003 Sep;121(9):1238-45. **4.** Greaney MJ, Hoffman DC, Garway-Heath DF, Nakla M, Coleman AL, Caprioli J. Comparison of optic nerve imaging methods to distinguish normal eyes from thosewith glaucoma. Invest Ophthalmol Vis Sci. 2002 Jan;43(1):140-5.

P109 EVALUATION OF RETINAL NERVE FIBER LAYER THICKNESS MEASUREMENTS AFTER LASIK USING SCANNING LASER POLARIMETRY

T. Dada, R. Muralidhar, S. Chaudhary, N. Sharma, R. Sihota, R.B. Vajpayee
Dr Rajendra Prasad Centre for Ophthalmic, New Delhi, India

Purpose: To evaluate Retinal Nerve Fiber Layer measurements before and after LASIK[1-4] as determined by scanning laser polarimetry (SLP) with an individualized corneal compensation device.
Design: Interventional case series.
Participants: Twenty myopic patients undergoing LASIK.
Methods: Forty eyes of 20 patients who were to undergo LASIK for myopia (> - 3 D) were evaluated using the GDXVCC scanning laser polarimeter (Laser Diagnostic Tech, USA). Postoperative measurements were then obtained with newly determined customized compensation, 24 hours after the surgery.
Main outcome measures: The RNFL parameters of Superior average thickness, Inferior average thickness, TSNIT average thickness and NFI were obtained before and after LASIK surgery and compared by use of paired Student's *t* tests.
Results: The mean age of the patients was 22.6 ± 3.2 yrs. The mean Superior average, Inferior average, and TSNIT average thickness before and after LASIK was 64.66 um ± 6.76 um *vs* 64.61um ± 7.13um (p =0.98), 61.55 um ± 7.27 um *vs* 63.39um ± 8.99um (p = 0.35) and 52.19 um ± 4.17 um *vs* 53.38um ± 4.97um (p = 0.28) respectively. The mean pre LASIK NFI was 19.74 ± 7.63 as compared to 21.16 ± 8.9 after LASIK (p = 0.48) . None of parameters showed statistically significant differences between preoperative and postoperative values.
Conclusions: There is no affect of LASIK on the retinal nerve fiber layer.
References:
1. Zangwill LM, Abunto T, Bowd C, Angeles R, Schanzlin DJ, Weinreb RN. Scanning laser polarimetry retinal nerve fiber layer thickness measurements after LASIK. Ophthalmology. 2005 Feb;112(2):200-7. **2.** Choplin NT, Schallhorn SC, Sinai M, Tanzer D, Tidwell JL, Zhou Q. Retinal nerve fiber layer measurements do not change after LASIK for high myopia as measured by scanning laser polarimetry with custom compensation.
Ophthalmology. 2005 Jan;112(1):92-7. **3.** Katsanos A, Kothy P, Nagy ZZ, Hollo G. Scanning laser polarimetry of retinal nerve fibre layer thickness after laser assisted in situ keratomileusis (LASIK): stability of the values after the third post-LASIK month. Acta Physiol Hung. 2004;91(2): 119-30. **4.** Hollo G, Katsanos A, Kothy P, Kerek A, Suveges I. Influence of LASIK on scanning laser polarimetric measurement of the retinal nerve fibre layer with fixed angle and customised corneal polarisation compensation. Br J Ophthalmol. 2003 Oct;87(10):1241-6.

P110 RELATIONSHIP BETWEEN PATTERNS OF VISUAL FIELD LOSS AND SCANNING LASER POLARIMETRY-DERIVED RETINAL NERVE FIBER LAYER MEASUREMENTS IN DIAGNOSTIC INNOVATIONS IN GLAUCOMA STUDY (DIGS)

E.M. Hoffmann[1], F.A. Medeiros[2], P.A. Sample[2], R.R. Bourne[2], C. Boden[2], C. Bowd[2], L.M. Zangwill[2], R.N. Weinreb[2]
[1] University of Mainz, Germany, [2]Hamilton Glaucoma Center, La Jolla, CA, United States of America

Introduction: The structural and functional relationship between optical imaging methods and standardized automated perimetry in glaucoma patients has been investigated over a wide range of glaucoma severities[1-3]. This enables the validation of functional measurements as surrogates for retinal ganglion cell measurement and a better understanding of the pathology of glaucoma. However, no study has evaluated the association of clinically identifiable patterns of visual field loss and localized RNFL loss.
Aim of the study: To investigate the association between patterns of visual field (VF) loss and retinal nerve fiber layer (RNFL) thickness measurements obtained with scanning laser polarimetry (GDX VCC).
Methods: 121 glaucoma patients and 65 healthy subjects were included. (Mean age 67.0 ± 12.0 years and 65.0 ± 8.7 years, respectively). All glaucoma patients had repeatable abnormal VFs using standard automated perimetry (SAP SITA) and GDx VCC imaging within six months. GDx VCC RNFL thickness measurements were obtained from 16 equal parapapillary sectors. Patterns of VF loss were classified as arcuate, partial arcuate, nasal step, or paracentral in each VF hemifield[4]. Logistic regression analysis was performed to determine which RNFL sectors were associated with each VF pattern. The ability of GDx VCC to discriminate between patients with different VF patterns and healthy subjects using ROC curve analyses was also investigated.
Results: Arcuate (n=29), partial arcuate (n=29) nasal step (n=17), and paracentral (n=18) VF patterns in the superior hemifield were significantly associated with RNFL sectors in the temporal and temporal-inferior hemiretina (P < 0.001). ROC curve areas for discrimination between patients with different patterns of VF loss and healthy subjects ranged from 0.85 to 0.95. VF patterns in the inferior hemifield (Arcuate, n=12, partial arcuate, n=15, nasal step, n=30, paracentral, n=17) were most strongly associated with temporal and temporal-superior RNFL sectors (P <= 0.02). ROC curve areas for discrimination between different patterns of VF loss and healthy subjects ranged from 0.73 to 0.98. In addition, GDx VCC could discriminate between normal VF hemifields in glaucoma patients and VF hemifields in healthy subjects (ROC curve area = 0.81 for the superior VF hemifield, 0.73 for the inferior VF hemifield, respectively).
Conclusion: The RNFL in the specific sectors of the parapapillary retina was topographically related to patterns of visual field loss. GDx VCC can differentiate between apparently normal VF hemifields in glaucoma patients and normal VF hemifields in healthy subjects.
References:
1. Anton A, Yamagishi N, Zangwill L, Sample PA, Weinreb RN. Mapping structural to functional damage in glaucoma with standard automated perimetry and confocal scanning laser ophthalmoscopy. Am J Ophthalmol. 1998;125:436-46. **2.** Tannenbaum DP, Zangwill LM, Bowd C, Sample PA, Weinreb RN. Relationship between visual field testing and scanning laser polarimetry in patients with a large cup-to-disk ratio. Am J Ophthalmol. 2001;132:501-6. **3.** Bowd C, Zangwill LM, Weinreb RN. Association between scanning laser polarimetry measurements using variable corneal polarization compensation and visual field sensitivity in glaucomatous eyes. Arch Ophthalmol. 2003;121:961-6. **4.** Keltner JL, Johnson CA, Cello KE *et al.* Classification of visual field abnormalities in the ocular hypertension treatment study. Arch Ophthalmol. 2003;121: 643-50.

P111 COMPARISON OF OPTIC NERVE HEAD TOPOGRAPHY IN HEALTHY ADULTS USING HEIDELBERG RETINA TOMOGRAPH AND RETINAL THICKNESS ANALYSER

B. Cvenkel[1], A. Rekic[2]
[1]University Eye Clinic Ljubljana, Ljubljana, Slovenia, [2]University Eye Clinic, Ljubljana, Slovenia

Purpose: To compare optic nerve head (ONH) topography measurements acquired with Heidelberg Retina Tomograph I. (HRT) and Retinal Thickness Analyser (RTA) and to determine clinical agreement between the devices.
Design: Prospective observational case series.
Participants: Fifty eyes of 50 healthy subjects older than 40 years were included in the study.
Intervention: After ophthalmologic examination and fundus photography, HRT and RTA were performed. To determine repeatability of measurements HRT and RTA examinations were repeated in 10 volunteers after a week.
Main outcome measures: The differences between ONH parameters obtained by HRT and RTA were tested for significance with Wilcoxon signed rank test. Clinical agreement between the devices was assessed with the limits of agreement (LA) and the inter-test reproducibility of measurements expressed by repeatability coefficient and intraclass correlation coefficient (ICC).
Results: Significant differences between HRT and RTA parameters were observed for all parameters except for rim area (p = 0.051) and height variation contour (p = 0.054). Limits of agreement between HRT and RTA were wide. Repeatability coefficient was good (< 0.10) for all HRT parameters except for RNFL cross-sectional area (0.28). Repeatability coefficient was > 0.10 for RTA parameters: cup area (0.15), rim area (0.19), maximum cup depth (0.13), height variation contour (0.11) and RNFL cross-sectional area (0.14). ICC was good (>90 %) for all parameters, except for mean RNFL thickness (89%) for HRT and height variation contour (84%) for RTA.
Conclusions: The observed differences within 'limits of agreement' were clinically important and the two devices cannot be used interchangeably. At present, clinical usefulness of HRT is superior to RTA on account of better reproducibility of measurements, better software support and shorter duration of the examination.

References:
1. Asrani S, Shazhou Z, d'Anna S, *et al.* Noninvasive mapping of the normal retinal thickness at the posterior pole. Ophthalmology 1999;106:269-73. **2.** Itai N, Tanito M, Chihara E. Comparison of optic disc topography measured by Retinal Thickness Analyser with measurement by Heidelberg Retina Tomograph II. Jpn J Ophthalmol 2003;47:214-20. **3.** Martinez de la Casa JM, Garcia Feijoo J, Castillo Gomez A, *et al.* Correlations between RTA and HRT in optic disc analysis. Arch Soc Esp Ophthalmol 2004;79:21-5. **4.** Wollstein G, Garway-Heath DF, Hitchings RA. Identification of early glaucoma cases with scanning laser ophthalmoscope. Ophthalmology 1998;105:1557-63. **5.** Hermann MM, Theofylaktopoulus I, Bangard N, *et al.* Optic nerve head morphometry in healthy adults using confocal scanning laser tomography. Br J Ophthalmol 2004;88:761-5.

P112 STUDY OF PATIENTS WITH OCULAR HYPERTENSION WITH SCANNING LASER POLARIMETRY AND SHORT WAVELENGTH AUTOMATIC PERIMETRY

G.T. Georgopoulos[1], D. Papaconstantinou[1], J. Chalkiadakis[2], E. Patsea[2], A. Maragos[1], J. Apostolakis[1], M. Moschos[1]
[1]Athens University Medical School, Athens, Greece, [2]Ophthalmiatrion Eye Hospital, Athens, Greece

Introduction: It is well known that retinal nerve fiber layer (RNFL) defects and short-wavelength automated perimetry (SWAP) deficits may precede defects in white on white perimetry in patients with early glaucoma.
Aim of the study: To compare and correlate retinal nerve fiber layer (RNFL) measurements obtained by Scanning Laser Polarimetry (SLP) with defects detected by short wavelength automatic perimetry (SWAP) in eyes with ocular hypertension (OHT).
Methods: In this prospective study Scanning Laser polarimetry using fixed corneal compensation (GDx, LDT Inc) and SWAP (Humphrey 30-2) was performed in 96 eyes of 48 patients with OHT and normal white on white full threshold perimetry (Humphrey 30-2). The correlation of RNFL thickness measurements with SWAP field defects was examined.
Results: Twenty-five eyes (26 %) had SWAP visual field defects. Twenty-seven eyes (28.1 %) had abnormal RNFL evaluation defined by the GDx neural network (number > 29). Fourteen eyes of 10 patients (14.5%) had abnormal RNFL evaluation and SWAP visual field defects. Retinal nerve fiber layer thickness measurements were significantly reduced in eyes with abnormal SWAP. A statistically significant correlation between the 'number' in GDx and the Pattern Standard Deviation ($r = 0.3$ $p = 0.006$) and the Corrected Pattern Standard Deviation ($r = 0.3$ $p = 0.007$) in SWAP was found. Areas of abnormal RNFL thickness corresponded to the localization of the SWAP visual field defects in corrected pattern deviation plots in 10 of the 14 eyes with defects in both tests. Four patients (8.3%) had pathologic results in both tests in both eyes and nineteen patients (39.6%) had normal results in both tests in both eyes.
Conclusions: Visual field defects in SWAP frequently coexist and correspond with abnormalities of RNFL detected by SLP in eyes with ocular hypertension. In certain eyes however, the two methods detect different glaucoma properties.
References:
1. Weinreb RN, Zangwill L, Berry CC, Bathija R, Sample P. Detection of glaucoma with scanning laser polarimetry. Arch Ophthalmology 1998; 116:1583-1589 **2.** Hollü G, Szabó A, Vargha P. Scanning laser polarimetry *versus* frequency doubling perimetry and conventional threshold perimetry: Changes during a 12 month follow-up in preperimetric glaucoma. Acta Ophthalmol Scand 2001; 79:403-407 **3.** Greenfield DS, Knighton RW, Feuer WJ, Schiffman JC, Zangwill L, Weinreb RN. Correction for corneal polarization axis improves the discriminating power of scanning laser polarimetry. Am J Ophthalmol. 2002; 134:27-33.

P113 SCANNING LASER POLARIMETRY IN GLAUCOMATOUS EYES WITH PERIPAPILLARY ATROPHY

S.S. Sonty[1], A. Ahmad[2]
[1]University of Illinois-Chicago Eye Cente, Flossmoor, IL, United States of America, [2]Midwest Eye Center SC, Calumet City, United States of America

Introduction: In the Para (Peri) Papillary region Chorioretinal Atrophy can be seen as a Peripapillary Halo as described by Primrose as an early sign of Glaucoma. Wilensky and Kolker graded peripaillary halos and atrophies and found that the degree of halo was virtually identical in patients with or without Glaucoma, but the degree of atrophy was significantly greater in Glaucomatous eyes. More recently Anderson suggested a possible association between localized glaucomatous changes and the peripapillary atrophy indicating a weakness in the segment of the Choroid/Retina and suggested that peripapillary atrophy might account for the development of low tension glaucoma. Heijl found significant correlation between location of the peripapillary atrophy and visual field defects. Airaksinen *et al* found a weak correlation between the increase in the area of peripapillary atrophy and decrease in the rim area with longterm followup. Around the optic disc as decsribed by Jonas there is usually a welldefined white or yellowish white ring. This zone is called the Scleral Rim or the Elschnig Ring. In the Para (Peri) papillary region the chorioretinal atrophy can be distinguished into Two Zones. The peripheral Alpha Zone characterized by an irregular hypopigmentation and hyperpigmentation with thinning of the chorioretinal tissue layer. The central Beta Zone is characterized by visible Sclera and visible large choroidal vessels or with the perpapillary scleral ring. In eyes with glaucomatous optic nerve atrophy both these zones are significantly larger and Beta Zone occurs more frequently than in normal eyes. The Para (Peri) Papillary atrophic changes are more common in Normal Tension Glaucoma compared to Ocular Hypertension (Buus *et al*) Peripapillary Atrophy and Disc Hemorrhages can also be seen in Normal Healthy subjects though they are more frequent in Normal Tension Glaucoma Eyes (Sugiyama *et al*) Peripapillary atrophic changes increase with progressive glaucoma (Uchida *et al*) Sonty *et al* reported decreasing amplitudes of the TSNIT graphs in 22 eyes of 11 patients with increasing glaucoma by Scanning Laser Polarimetry
Aim of the study: To evaluate the nerve fiber layer thickness and correlate the relative extent and size of Peripapillary atrophy (PPA) with the nervefiber layer thickness measured by Scanning Laser Polarimetry to assess the correlation of TSNIT graph amplitudes with Different extents of Peripapillary atrophy by degrees of arc/circle of PPA
Methods: Scanning laser Polarimetry was done with GDX Access on 186 eyes (93 Patients) with Glaucomatous Discs with varying degrees of peripapillary atrophy.All patients had segmental or circumferential peripapillary atrophy. The Ring of atrophy was classifed as 0 - 90 degrees, 91 - 180 degrees, 181 - 270 degrees, and 271 - 360 degrees. The means of Total Amplitudes of the TSNIT graphs were analyzed and compared
Results: 88 eyes had 0 -90 degrees of PPA, 30 eyes 91 -180 degrees PPA, 46 eyes : 181 - 270 degrees PPA and 22 eyes : 271 - 360 degrees PPA. The Mean amplitudes of TSNIT graphs showed 55.5 Units in Glaucomatous discs with 0 - 90 degrees PPA, 47.0 Units in Optic DIscs with 91 -180 degrees PPA, 39.0 Units in Optic Discs with 181 - 270 degrees of PPA and 23.9 Units in Optic Discs with 271 - 360 degrees PPA showing decreasing Mean TSNIT Graph amplitudes with Increasing degrees of Peri Papillary Atrophy (PPA)
Conclusions: Decrease in Nerve Fiber Layer thickness by TSNIT Graph Mean Amplitudes was noted with Incraesing degrees of Peripapillary Atrophy indicating possible Ischemic Association to Nerve Fiber Loss in Glaucomatous eyes.
References:
1. Primrose J : The incidence of Peripapillary Halo Glaucomatosus Trans Ophthalmol Soc UK 89:585,1969 **2.** Wilensky JT & Kolker AE : Peripapillary Changes in GLaucoma Amer J Ophthalmol 81:341, 1976. **3.** Anderson DR : Correlation of peripapillary natomy with disc damage and field abnormalities in Glaucoma Fifth International Visual Field Symposium, EL Greve & Heijl AJ eds 1983. **4.** Heijl AJ & Samander C: Peripapillary atrophy and glaucomatous visual field defects Sixth International Visual Field Symposium EL Greve & AJ Heijl Eds 1985 **5.** Airaksinen PJ *et al* : Change of Peripapillary Atrophy in Glaucoma Glaucoma Update Kriegekstein GK Ed: 1987 **6.** Jonas JB *et al* Para Papillary chorioretinal Atrophy in Normal and Glaucoma eyes I. Morphometric Data Invest Ophalmol Vis Sci 30:908, 1989. **7.** Buus DR *et al* Peripapillary Crescents and halos in Normal Tension Glaucoma and Ocular Hypertension Ophthalmol 96:1 : 16, 1989. **8.** Uchida *et al.* Increasing peripapillary Atrophy is associated with progressive glaucoma Ophthalmol 105: 1541, 1998. **9.** Yoshikawa K *et al* Stereometry of Temporal perpapillary atrophy in early stage open angle glaucoma Acta Soc Ophthalmol 103 : 538, 1999. **10.** Sonty S & Ahmad A Scanning Laser Polarimetry in Glaucomatous Eyes with Peri Papillary Atrophy (PPA) Clinical & Experimental Ophthalmology 30: 548, - A290 , 2002

P114 SCANNING LASER POLARIMETERY IN OPEN-ANGLE GLAUCOMA WITH HEMIFIELD DEFECTS

G. Tomita[1], Y Nakai[2], K. Inoue[3], M. Wakakura[2], J. Inoue[2]
[1]The University of Tokyo School of Med, Tokyo, Japan, [2]Inoue Eye Hospital, Tokyo, Japan, [3]Inoue Eye Hosipital, Tokyo, Japan

Purpose: To evaluate retinal nerve fiber layer (RNFL) thickness using scanning laser polarimetry with variable corneal polarization compensator (SLP) in patients with chronic open-angle glaucoma with hemifield defect and to compare RNFL thickness with that of normative eyes.
Design: Prospective comparative observational case series.
Participants: Forty-eight eyes of 48 patients with chronic open-angle glaucoma with achromatic visual fields defects (Humphrey visual field, program SITA central 30-2) limited to superior or inferior hemifield, and 40 eyes of 40 normative subjects were enrolled in the study. The mean (± SD) of age, refractive errors, and the mean defect (MD) of visual field was 54.3 ± 11.5 years, -3.7 ± 3.0 D, -6.27 ± 3.29 dB, respectively for the glaucomatous eyes, and 50.5 ± 10.9 years, -2.2 ± 2.5 D, -0.51 ± 1.60 dB, respectively for the normative eyes. There was no statistically significant age difference between glaucomatous and normative eyes.
Main outcome measure: Differences in RNFL thickness between the superior and inferior sectors, and between glaucomatous and normal eyes.
Method: The SLP was performed for each eye within three months of visual field testing. After imaging of a macular region, RNFL retardation measurements with image quality score over eight were obtained. The superior and inferior averages of RNFL thickness measurements were used for analyses.
Results: In glaucomatous eyes with superior hemifield defects (31 eyes) and those with inferior hemifield defects (17 eyes), the RNFL thickness corresponding to the affected hemifield was significantly thinner than that corresponding to the apparently unaffected hemifield ($P < 0.001$ and $p = 0.004$), whereas no such a difference was observed in the normative eyes. The RNFL thickness of the unaffected hemifield in glaucomatous eyes was significantly thinner than in normative eyes ($P < 0.01$).
Conclusion: In glaucomatous eyes with achromatic visual field defects limited to one hemifield, the SLP seems to detect glaucomatous damage of the RNFL in the unaffected hemifield.
References:
1. Quigley HA, Miller NR, George T. Clinical evaluation of the nerve fiber layer as an indicator of glaucomatous optic nerve damage. Arch Ophthalmol 1980;98:1564-1571. **2.** Chi QM, Tomita G, Inazumi K, *et al.* Evaluation of the effect of aging on the retinal nerve fiber layer thickness using scanning laser polarimtery. J Glaucoma 1995;4:406-413. **3.** Kondo Y, Yamamoto T, Sato Y, *et al.* A frequency-doubling perimetry study in normal-tension glaucoma with hemifield defect. J Glaucoma 1998;7:261-265. **4.** Reyes RD, Tomita G, Kitazawa Y. Retinal nerve fiber layer thickness within the area of apparently normal visual field in normal-tension glaucoma with hemifield defect. J Glaucoma 1998;7:329-335. **5.** Wu L-L, Suzuki Y, Kunimatsu S, *et al.* Frequency doubling technology and confocal scanning ophthalmoscopic optic disc analysis in open-angle glaucoma with hemifield defects. J Glaucoma 2001;10:256-260. **6.** Colen TP and Lemij HG. Sensitivity and specificity of the GDx: clinical judgment of standard printouts *versus* the Number. J Glaucoma 2003,12:129-133.

P115 SCANNING LASER POLARIMETRY OF THE RETINAL NERVE FIBER LAYER IN ALZHEIMER'S DISEASE

M.E. Turacli[1], O. Tekeli[2], A. Bingöl[3], F. Ozdemir[2]
[1]Ankara University, School of Medicine, Ankara, Turkey, [2]Ankara University, Ankara, Turkey, [3]Department of Neurology, Ankara, Turkey

Purpose: To evaluate Alzheimer's disease (AD) patients for the presence of glaucoma and to examine the retinal nerve fiber layer (RNFL) with scanning laser polarimetry.
Design: Case-control study
Participants and/or controls: This study consisted of 21 patients with AD (Group 1), and 27 controls (Group 2). There were 10 female and 11 male in group 1, and 13 female and 14 male in group 2.
Methods: All participants underwent a complete ophthalmic examination. The RNFL of the patients and controls was evaluated by scanning laser polarimetry (The nerve fiber analyzer-GDx, 2.0.09 version Laser Diagnostic Technologies, San Diego).
Main outcome measure: The standard GDx parameters were determined.
Results: In group 1, one patient (4.76%)(2eyes) was found to have primary open angle glaucoma and one patient (4.76%) (two eyes) had pseudoexfoliation glaucoma. In group 2, we detected pseudoexfoliation syndrome in the right eye of one patient (3.7%) (one eye). When we compared GDx parameters, there were no significant differences between group 1 and 2 ($p>0.05$).
Conclusion: We did not detect alterations in RNFL and increased frequency of glaucoma in AD. A possible causative of this result may be related to earlier or moderate stages of the disease.
References:
1. Kergoat H, Kergoat MJ, Justino L, Chertkow H, Robillard A, Bergman H. An evaluation of the retinal nerve fiber layer thickness by scanning laser polarimetry in individuals with dementia of the Alzheimer type.Acta Ophthalmol Scand. 2001 Apr;79(2):187-91

P116 ASSESSMENT OF OPTIC DISC MORPHOLOGY USING HEIDELBERG RETINA TOMOGRAPH IN EYES WITH GLAUCOMA WITH HEMIFIELD VISUAL FIELD DEFECTS

A. Kusuhara, M. Nakamura, A. Kanamori, A. Negi
Kobe University School of Medicine, Kobe, Japan

Purpose: To evaluate optic disc morphology in eyes with glaucoma dominantly having hemifield visual field defects using Heidelberg Retina Tomograph (HRT).
Design: Cross-sectional study.
Participants and controls: Eighty eight eyes of 68 patients and 41 eyes of 35 patients with glaucoma who had superior and inferior hemifield dominant visual field defects detected in Humphrey 30-2 testing, respectively, and 118 eyes of 86 normal subjects were included.
Methods: All the participants were imaged using HRT (software version 3.04). Some of obtained parameters were compared among three groups. ANOVA with Bonferroni/Dunn test was used as a statistic analysis. $P<0.05$ was judged as significant difference.
Main outcome measures: HRT parameters including global and segmental measurements of rim area, rim volume, cup/disc (C/D) area ratio, mean cup depth, and mean retinal nerve fiber layer (RNFL) thickness.

Results: All the parameters analyzed but superotemporal and superonasal measurements of mean RNFL thickness were found to have significant difference between the eyes with superior hemifield defects and normal subjects, while all the parameters of the eyes with inferior hemifield defects were significantly different from those of normal eyes. Between the two groups of eyes with glaucoma, superotemporal and inferotemporal measurements of rim area, rim volume, and C/D area ratio as well as superotemporal measurements of mean RNFL thickness showed significant difference.
Conclusions: Our results further suggest the notion that anatomical changes of optic disc precede the functional loss. In addition, HRT detects segmental morphological changes of optic disc corresponding to hemifield dominant visual field defects in glaucoma eyes.
References:
1. Dreher AW, Weinreb RN. Accuracy of topographic measurements in a model eye with the laser tomographic scanner. Invest Ophthalmol Vis Sci 1991;32:2292-6. **2.** Miglior S, Albe E, Guareschi M, *et al.* Intraobserver and interobserver reproducibility in the evaluation of optic disc stereometric parameters by Heidelberg Retina Tomograph. Ophthalmology 2002;109:1072-7. **3.** Quigley HA, Dunkelberger GR, Green WR. Retinal ganglion cell atrophy correlated with automated perimetry in human eyes with glaucoma. Am J Ophthalmol 1989;107:453-64. **4.** Weinreb RN, Shakiba S, Zangwill L. Scanning laser polarimetry to measure the nerve fiber layer of normal and glaucomatous eyes. Am J Ophthalmol 1995;119:627-36. **5.** Reyes RDC, Tomita G, Kitazawa Y. Retinal nerve fiber layer thickness within the area of apparently normal visual field in normal-tension glaucoma with hemifield defect. J Glaucoma 1998;7:329-35. **6.** Kook MS, Sung KR, Kim S, *et al.* Study of retinal nerve fibre layer thickness in eyes with high tension glaucoma and hemifield defect. Br J Ophthalmol 2001;85:1167-70.

P117 SCANNING LASER POLARIMETRY IN MYOPIC AND EMMETROPIC PATIENTS
M. Rajamani[1], T. Dada[2], S. Choudhary[1], R. Sihota[1]
[1]Dr.R.P.Center for Ophthalmic Sciences, New Delhi, India, New Delhi, India

Introduction: The nerve fiber layer analyzer uses a scanning laser polarimeter to measure nerve fiber thickness. A sensitivity of 62% and a specificity of 96% has been reported in distinguishing normal and glaucomatous patients[1]. No differences have been noted between pre- and post-lasik measurements suggesting that the instrument adequately compensates for anterior segment birefringence[2]. Kremmer S *et al.*[3], and Ozdek SC *et al.*[4], reported significantly reduced nerve fiber layer thickness in myopes. The instrument is said to be able to compensate for refractive errors from -10.0D to +5.0D (manufacturer's information). While it is possible that myopes actually have a lower nerve fiber thickness, this would have implications on the ability of the instrument to diagnose glaucoma in myopes. We therefore decided to compare the nerve fiber thickness in emmetropes and myopes using the GDx VCC nerve fiber analyzer.
Objective: To compare the nerve fiber thickness in emmetropes and myopes between 4.0D to 8.0D using the GDx VCC nerve fiber analyzer.
Design: Non-randomized clinical trial.
Participants: 25 emmetropes and 25 myopes between 20 and 40 years with refractive error between 4.0 and 8.0D who were otherwise healthy with no ocular comorbidity were selected for the study.
Material and methods: All the study participants underwent a detailed history, anterior and posterior segment examination with special reference to the cup disc ratio to rule out glaucoma. The applanation tension was recorded. Only subjects with IOP < 21mmHg and C:D ratio < 0.5:1 were included for the study. All subjects underwent a scanning laser polarimetry with the GDx VCC nerve fiber layer analyzer.
Main outcome measures: The TSNIT average, the superior average, the inferior average and the nerve fiber index were recorded.
Results: The mean TSNIT average in the emmetropic group was 52.19 ± 4.17 while that in the myopic group was 53.38 ± 4.97. These differences were not significant (p=0.28). The superior average in the emmetropes was 64.66 ± 6.76 while that in myopes was 64.61 ± 7.13. These differences were also not significant (p=0.98). The inferior average in emmetropes (61.55 ± 7.27) was also not significantly different (p=0.35) from myopes (63.39 ± 8.99). The nerve fiber index in myopes was 19.74 ± 7.63 while that in emmetropes was 21.16 ± 8.90. These differences were not statistically significant (p=0.48)
Conclusion: No significant differences were noted in any of the parameters between the two groups. This contrasts with the study of Kremmer S *et al.*,[3] and Ozdek SC *et al* [4]. It is likely that the instrument compensation is adequate for myopia. We recommend that a larger study be done to examine the effect of refractive errors on the instrument accuracy.
References:
1. Paczka JA, Friedman DS, Quigley HA, Barron Y, Vitale S. Diagnostic capabilities of frequency-doubling technology, scanning laser polarimetry, and nerve fiber layer photographs to distinguish glaucomatous damage. Am J Ophthalmol 2001 Feb;131(2):188-97 **2.** Zangwill LM *et al.*, Scanning laser polarimetry retinal nerve fiber layer thickness measurements after LASIK. Ophthalmology. 2005 Feb;112(2):200-7. **3.** Kremmer S, Zadow T, Steuhl KP, Selbach JM. Scanning laser polarimetry in myopic and hyperopic subjects. Graefes Arch Clin Exp Ophthalmol. 2004 Jun;242(6):489-94. **4.** Ozdek SC, Onol M, Gurelik G, Hasanreisoglu B. Scanning laser polarimetry in normal subjects and patients with myopia. Br J Ophthalmol 2000 Mar;84(3):264-7

P118 A DEFINED CHANGE OF POLARIZATION AXIS IS DETECTED BY VARIABLE CORNEAL COMPENSATION OF THE GDXVCC
E.S. Schmidt, A.G. Boehm, L.E. Pillunat
University of Dresden, Dresden, Germany

Introduction and aim of the study: To examine whether a defined change of polarization axis (PA) is detected by the variable cornea compensation of the GDxVCC. The idea behind was to induce a change of PA by a rotation of the eye and to determine whether the rotation affects the magnitude of retardation and RNFL measurements. If it could be shown that the measured axis is rotated to the same amount as the eye and magnitude and RNFL parameters are unaffected this would prove the proper operativeness of the variable corneal compensator.
Methods: Fifteen normal eyes were examined with the GDxVCC. First scans (cornea and optic nerve head) of the right eye in regular position (position 0°) were performed. In this position the scans are recognized and saved regularly as a right eye by the instrument. Then a second scan set of the same eye was taken: the subjects turned their head upside-down (position 180°). These scans in the 180° position of the right eye were recognized and saved as a left eye by the instrument. A 180° rotation of a right eye results in the same relative position of the optic nerve head and the macula of a left eye. For each scan the instrument calculates the polarization parameter axis and magnitude of the AS. For the left eyes the procedure was adopted accordingly.
Results: Difference of Magnitude of AS was 4.3 ± 3.7 nm (range 0–12 nm) and difference of axis was 3.5 ± 2.4° (range 0.1°-8.1°). There were no significant differences in all measured parameters between the 'normal' and the turned eye (all P>0.2; paired *t*-tests).
Conclusion: A defined change of the polarization axis was detected by the variable cornea compensation of the GDxVCC. The instrument was able to reproduce the polarization parameters of the AS of the same eye in two different positions with adequate accuracy. The measured axis was rotated to the same amount as the eye was rotated and the magnitude and RNFL parameters were unaffected. This suggests a proper operativeness of the variable corneal compensator of the GDxVCC.
References:
1. Van Blokland GJ, Verhelst SC. Corneal polarization in the living human eye explained with a biaxial model. J Opt Soc Am A 1987;4(1):82-90. **2.** Knighton RW, Huang XR. Linear birefringence of the central human cornea. Invest Ophthalmol Vis Sci 2002;43(1):82-6. **3.** Zhou Q, Weinreb RN. Individualized compensation of anterior segment birefringence during scanning laser polarimetry. Invest Ophthalmol Vis Sci 2002;43(7):2221-8. **4.** Weinreb RN, Shakiba S, Zangwill L. Scanning laser polarimetry to measure the nerve fiber layer of normal and glaucomatous eyes. Am J Ophthalmol 1995;119(5):627-36.

P119 EFFECTS OF HORMONE REPLACEMENT THERAPY ON OPTIC NERVE HEAD TOPOGRAPHY IN HEALTHY POSTMENOPAUSAL WOMEN
Y. Akar, I. Yucel, M.E. Akar, Y. Akar, A. Ozel
Akdeniz University School of Medicine, Antalya, Turkey

Introduction: To evaluate the effect of hormone replacement therapy on optic nerve head topography of the healthy postmenopausal women.
Methods: A prospective, controlled, randomized study was performed on 76 healthy women who had been in spontaneous menopause for at least two years. All subjects were free of any systemic and ocular diseases. Thirty-two women (group A) were treated with transdermal 17-estradiol (50 µg/day) and medroxyprogesterone acetate (10 mg/day) for 12 days per cycle. Untreated 45 women were used as a control group. All subjects underwent complete ophthalmological examination and optic nerve head topographic analysis using confocal scanning laser ophthalmoscope, HRT II (Heidelberg Retina Tomograph, version 1.6.0, Heidelberg, Germany) at baseline, and the examinations were repeated at three month intervals during a one year follow up. Disc area ana a total of 12 topographic parameters were analysed.
Results: The mean age of the subjects was 51.6 ± 3.3 years. There were no significant difference in between ages of treated and untreated groups (P>0.05). The mean inraocular pressure of two groups were significantly lower in treated group (12.4 ± 2.1 mmHg) (P<0.05). Neuroretinal rim area, neuroretinal rim area/disc area ratio, and linear cup to disc ratio parameters were found to be significantly higher in treated group (P<0.05). All other topographic parameters were found to not to be different significantly (all P values, >0.05).
Conclusions: Hormone replacement therapy has decreased the intraocular pressure, and affected the cup and rim parameters of the optic nerve head topography significantly. This should be taken into consideration in evaluation of the glaucomatous postmenopausal women.

P120 PARAPAPILLARY FUNDUS AUTOFLUORESCENCE IN OHT, POAG, AND CONTROLS.
A. Viestenz[1], A. Langenbucher[2], R. Lämmer[2], G.O.H. Naumann[2], C.Y. Mardin[2]
[1]Department of Ophthalmology, Erlangen, Germany, [2]University Erlangen-Nürnberg, Erlangen, Germany

Introduction: Electron microscopy has revealed a pronounced amount of lipofuscin in the retinal pigment epithelium cells in parapapillary atrophic zone alpha in eyes with high pressure glaucoma. Lipofuscin is one of the main detergents of fundus autofluorescence and can be visualised *in vivo*.
Objective: To assess the pronounced parapapillary fundus autofluorescence (PAF) of zone alpha in ocular hypertension (OHT) or primary open angle glaucoma (POAG).
Participants and methods: Case-controlled cross-sectional prospective study of 200 consecutive eyes (69 controls, 59 OHT, 72 POAG). Detection of PAF with a confocal scanning laser ophthalmoscope (HRA, Heidelberg Engineering, Germany). The PAF was measured with the Heidelberg standard imaging software. Additional measurements were: visual field test, 24 h-intraocular pressure profile, central corneal thickness (Tomey, AL-2000 pachymeter), and 15° stereo fundus photographs (Zeiss telecentric fundus camera). The staging of glaucomatous optic nerve damage according to Jonas was performed by two experienced ophthalmologists.
Main outcome measures: The amount of PAF, and its distance from the optic nerve head.
Results: The PAF-area was smaller in controls (0.07 ± 0.10 mm2) than in OHT (0.16 ± 0.16 mm2; p<0.001). The maximum of PAF was found in POAG (0.33 ± 0.71 mm2) in contrast to controls (p=0.003) and OHT (p=0.059). The distance between PAF-area and the optic nerve head was longer in POAG than in OHT (p<0.001) and controls (p<0.001). No PAF was detected in zone beta, but in zone alpha.
Conclusions: Manifest POAG have more distant and larger PAF-areas in contrast to OHT or controls in descending order. The autofluorescence analysis could be an additional tool to visualise early changes in the parapapillary atrophic zone alpha in OHT or POAG.
References:
1. Viestenz A, Mardin CY, Langenbucher A, Naumann GOH. In-vivo measurement of autofluorescence in the parapapillary atrophic zone of optic discs with and without glaucomatous atrophy. Klin Monatsbl Augenheilkd 2003: 220:545-550

P121 ANALYSIS OF THE OPTIC DISC AND NERVE FIBRE LAYER IN GLAUCOMA AND GLAUCOMA SUSPECT EYES: HRT II CONFOCAL SCANNING LASER OPTHALMOSCOPE *VERSUS* GDX VCC SCANNING LASER POLARIMETER AND STRATUS OPTICAL COHERENCE TOMOGRAPH (OCT)
A.T. Doyle[1], G.S. Ying[2], A. Bensaid[3], H. Krameisen[3], Y. Lachkar[1]
[1]Fondation Hôpital St. Joseph, Paris, France, [2]University of Pennsylvania, Philadelphia, PA, United States of America

Purpose: To determine the strength of correlation between measurements of the same structures using HRT-II, GDx VCC and Stratus OCT in a group of eyes with, or at risk of developing glaucomatous optic neuropathy.
Design: Cross-sectional study.
Methods: 65 eyes of 35 subjects with glaucomatous optic neuropathy(N=21) or glaucoma suspects (ocular hypertension or suspicious discs, N=14). Each subject had SLO (Heidelberg Retinal Tomograph II), SLP (GDx-VCC) and OCT (Stratus OCT) performed within 6 weeks of each other. Automated perimetry was performed using the Octopus 101, 30 degree field. The Pearson correlation coefficients were calculated from linear correlation analysis and p-values were calculated using generalized estimating equations to adjust for the correlations between eyes of the same subject.
Main outcome measures: Cup/disc ratio, disc area, rim area, retinal nerve fibre layer (RNFL) thickness.
Results: The mean (±SD) age was 48.3 ± 15.7 years. 68.6% were female. 88.6% were Caucasian and 11.4% were of African origin. The mean of mean deviation (MD) and localised variance (LV) in the glaucoma group was 3.8 ± 2.6 and 20.8 ± 30.9 respectively and in the suspect eyes mean MD was 0.6 ± 1.6 and LV was 3.6 ± 1.2. Moderate and significant (p<0.0001) correlations were found between OCT and HRT for cup/disc ratio (r=0.77) and disc area (r=0.75) and between OCT and GDx for mean RNFL thickness (r=0.51) and superior RNFL thickness (r=0.74). Weak but significant (p<0.005) correlations were found between OCT and HRT for rim area (r=0.37) and RNFL thickness (r=0.34) and between OCT and GDx for inferior RNFL thickness (r=0.48). No significant correlation was seen between HRT and GDx for RNFL thickness (r=0.14, p=0.42).
Conclusions: Although significant correlations exist between these instruments when used to measure the same structures on the same patients, the correlations are only weak to moderate (r<0.80). The structural measurements may not reflect the true values suggesting that these investigational techniques are not yet sufficiently advanced to make accurate structural measurements of the optic disc and nerve fibre layer in established or preperimetric glaucoma.
References:
1. Medeiros FA, Zangwill LM, Bowd C, Weinreb RN. Comparison of the GDx VCC scanning laser polarimeter, HRT-II confocal scanning laser ophthalmoscope, and Stratus OCT optical coherence

tomograph for the detection of glaucoma. Arch Ophthalmol 2004;122:827-837 **2.** Lan YQ, Henson DB, Kwartz AJ. The correlation between optic nerve head topographic measurements, peripapillary nerve fibre layer thickness, and visual field indices in glaucoma. **3.** Hoh ST, Greenfield DS, Mistlberger A, Liebmann JM, Hiroshi I, Ritch R. Optical coherence tomography and scanning laser polarimetry in normal, ocular hypertensive and glaucomatous eyes. Ophthalmol 2000; 129:129-135 **4.** Greaney MJ, Hoffman DC, Garway-Heath DF, Nakla M, Coleman A, Caprioli J. Comparison of optic nerve imaging methods to distinguish normal eyes from those with glaucoma. Invest Ophthalmol Vis Sci 2002;43:140-145

P122 OPTIC NERVE HEAD TOLERANCE TO THE INCREASE OF INTRAOCULAR PRESSURE IN HEALTHY VOLUNTEERS, OCULAR HYPERTENSION AND PRIMARY OPEN ANGLE GLAUCOMA PATIENTS.

E.L. Akopov, Y.S. Astakhov
Pavlov State Medical University, Saint-Petersburg, Russian Federation

Purpose: The purpose of the study was to assess the optic nerve head (ONH) stability in measured short-term intraocular pressure (IOP) increase in healthy volunteers, patients with ocular hypertension (OHT) and initial primary open angle glaucoma (POAG) patients. 212 healthy volunteers were divided in two age groups: from 16 to 35 years (87 people) and from 36 to 74 (125 people). Thirty five OHT patients (42 –62 years old) were included in the third group and 84 patients (39 - 80 years old) with initial POAG in the last one. The mean cup depth (MCD) of the optic disc was evaluated with the Heidelberg retina tomographer (HRT II). After baseline examination suction cup was used to increase IOP for 10 mm Hg above baseline and MCD was determined again. IOP level was controlled by Perkins' tonometer before and during suction. IOP increase resulted in MCD increase in all cases. In group 1 mean increase was 18,7 ± 1,98 mm. In the second group the value was 22,3 ± 2,59 mm. In OHT group MCD mean increase was 19.7 ± 4.05 mm. There were no statistically significant differences in MCD mean increase values in healthy volunteers and OHT patients (t=1,39, p>0,05). In POAG group mean MCD increase was 49,1 ± 8,13 mm. The difference of this value was statistically significant when compared with that in the groups 2 and 3 (t=5,38, p<0,05). There was no correlation between age and MCD mean increase in healthy people.
Results: The investigation permits to establish criteria of normal and decreased stability of ONH to the induced elevation of IOP: we consider the MCD increase less than 25 mm as normal, 25 –40 mm as borderline and more than 40 mm as lack of lamina cribrosa stability.
References:
1. Astakhov Y.S., Dahl N.Y., Akopov E.L. 'Evaluation of changes of the disc of optic nerve after vacuum-compressive load with the help of Heldeiberg retinal tomograph (preliminary report)'. Klinicheskaya ophthalmologia. Vol. 4 N°2, p. 70-73, 2003. **2.** Azuara-Blanco A., Harris A., Cantor L.B. 'Reproducibility of optic disk topographic measurements with the Topcon ImageNet and the Heidelberg Retina Tomograph'. Ophthalmologica. Vol. 212. p. 95-98, 1998. **3.** Azuara-Blanco A, Harris A, Cantor LB, Abreu MM, Weinland M. 'Effects of short term increase of intraocular pressure on optic disc cupping'. Br J Ophthalmol. Vol. 82. p. 880-883,1998. **4.** Gamm E.G., Abdulkadirova M.Z. 'Method of the estimation of stability of optic nerve to increase of intraocular pressure'. Vestnik Ophthalmologii. N° 1. p. 7-9,1989. **5.** Mikelberg F., Wijsman K., Schulzer M. 'Reproducibility of topographic parameters obtained with the Heidelberg retinal tomography'. Journal of Glaucoma. Vol. 2. p.101-103, 1993. **6.** Morgan W.H., Chauhan B.C., Yu D.Y., Cringle S.J., Alder V.A., House P.H. 'Optic disc movement with variation in intraocular and cerebrospinal pressure'. Investigative Ophthalmology and Visual Science. Vol. 43. p.3236-3242, 2002. **7.** Rohrschneider K., Burk R.O., Kruse F.E., Volcker H.E. 'Reproducibility of the optic nerve head topography with new laser tomographic scanning device'. Ophthalmology. Vol. 101, N°6. p. 1044-1049, 1994. **8.** Sihota R., Gulani V., Agarwal H.C., Saxena R., Sharma A., Pandey R.M. 'Variables affecting test-retest variability of Heidelberg Retina Tomograph II stereometric parameters'. J. Glaucoma. Vol.11, N° 4. p. 321-328, 2002. **9.** Shiman J.S., Imaging in Glaucoma. P. 13-17. Slack. Thorofare, 1996. **10.** Volkov V.V. Pseudonormal Pressure Glaucoma. 351 p. Meditsina. Moskva, 2001.

P123 COMPARISON OF HEIDELBERG RETINA TOMOGRAM (HRT II), SCANNING LASER POLARIMETRY (GDX VCC) AND STRATUS OPTICAL COHERENCE TOMOGRAM (OCT 3) IN THE DIAGNOSIS OF EARLY GLAUCOMA IN INDIAN EYES

S. Garudadri, R.S Kumar, B. Arumugham, A.U. Kumar, R. Thomas
LV Prasad Eye Institute, Hyderabad, India

Introduction: Studies on structure and function correlation in glaucoma have shown that structural changes of the optic nerve head usually precede functional changes as determined by standard automated perimetry. Accordingly, assessment of structural changes by the newer imaging modalities (HRT II, GDx VCC, OCT 3) could aid the early diagnosis of glaucoma.
Aim of the study: To compare the diagnostic capability of HRT II, GDx VCC and OCT 3 in early glaucoma in Indian eyes.
Methods: One randomly selected eye each of 56 early glaucoma patients and 100 normal subjects were studied. All subjects underwent complete ophthalmic examination including automated perimetry (HFA 24-2 / 30-2, SITA-Standard) and imaging with HRT II, GDx VCC and Stratus OCT 3. All subjects had visual acuity of =/> 20/40 and open angles. Normal subjects had IOP < 22 mm Hg, healthy discs and normal reliable fields. Early glaucoma patients had glaucomatous disc changes and corresponding field defects (MD =/> -6 dB, at least two of the three Anderson's criteria). Image quality criteria for inclusion were GDx: score =/> 8, HRT: SD <50 microns and OCT: SNR >33. The diagnostic ability of the three imaging technologies was compared using sensitivity, specificity and the area under the ROC curves. Positive (PPV) and negative predictive values (NPV) and Likelihood ratios (LR) were calculated to compare their efficacy in screening and in clinical diagnosis. The parameters assessed were; Moorfields Regression Analysis (MRA), FSM Discriminant Function, Cup Shape Measure for HRT; nerve fiber index (NFI) score, superior and inferior averages for GDx VCC; superior maximum, inferior maximum, superior average, inferior average and average thickness for OCT.
Results: For HRT, FSM discriminant function showed the best sensitivity (78.6%; 95% CI: 75-82.8) and specificity (80%; 95% CI: 76. –84). For GDx,NFI > 30 had the best sensitivity (82.1%: 95% CI: 77.6 –86.4) and specificity (87%; 95% CI: 84.6 - 88.6). For OCT, average nerve fiber thickness had the best sensitivity (83.9%; 95% CI: 75 – 92.8) and specificity (93%; 95% CI: 90.3 –96.6). The areas under the ROC curve for the three machines varied from 0.84 to 0.91 and were not significantly different (p= 0.15). Only 12 eyes were positive on all the three imaging techniques. At 5% prevalence (screening scenario), PPV and NPV were 20.4% and 98.6% for HRT (FSM), 24.4% and 98.9% for GDx (NFI >30), and 39.9% and 99% for OCT (average thickness). At 30 % prevalence (likely scenario in the clinic), PPV and NPV were 62.4 % and 89.4 % for HRT, 72 % and 91 % for GDx, 84 % and 93 % for OCT. Positive LR was 39.3 for MRA (outside normal limits), 44 for inferior average of GDx and 12.4 for average thickness in OCT.
Conclusions: All the three machines have similar diagnostic capability. OCT appears to have better potential as a screening tool. With the very high positive LR of MRA for HRT and inferior average for GDx, a positive test is strongly suggestive of disease in a clinical suspect.
References:
1. Quigley HA, Dunkelberger GR, Green WR,. Retinal ganglion cell atrophy correlated with automated perimetry in human eyes with glaucoma. Am J Ophthalmol 1989: 107: 453-64 **2.** Medeiros FA, Zangwill LM, Bowd C, Weinreb RN. Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and stratus OCT optical coherence tomograph for the detection of glaucoma. Arch 2004: 122; 827 - 37

P124 COMPARISON OF NERVE FIBER LAYER AND OPTIC DISC IMAGING METHODS FOR DETECTION OF EARLY GLAUCOMA

F. Badalà, B. Koucheki, K. Nouri-Mahdavi, S.K. Law, J.C Caprioli
JSEI, UCLA, Los Angeles, CA, United States of America

Purpose: To compare the performance of scanning laser polarimetry with variable corneal compensation (GDx-VCC), confocal scanning laser ophthalmoscopy (HRT II), and optical coherence tomography (Stratus OCT) for detection of early perimetric glaucoma.
Methods: One hundred-nine eyes from 109 patients (49 normal controls and 60 patients with open angle glaucoma) were included. The area under ROC curves (AUC) and sensitivity and specificity values were used to compare performance. Likelihood ratios were calculated based on the normative database of each device. Pairwise agreement between the methods was assessed with the kappa statistic.
Results: The average (±SD) visual field MD was -4.1 ± 2.5 dB and 0.08 ± 1.3 dB in the glaucoma and normal groups, respectively. The parameters with greatest AUC (Figure) for GDx-VCC, HRTII, and Stratus OCT were nerve fiber layer index (NFI) (0.938), Mikelberg discriminant function (0.899), and NFL average thickness (0.965). Comparison of AUCs for the best parameter of each device did not show a significant difference (p > 0.05 for all). The greatest sensitivities parameters at 95% specificity were: OCT average thickness (90%), GDx-NFI (82%), and HRT infratemporal cup/disc and rim/disc area ratios (78%). Abnormal test results were associated with very high positive likelihood ratios (>34) for each of the three methods. The best agreement among the techniques was found between NFI (GDx-VCC) and NFL average thickness (OCT),(kappa = 0.71; 95% CI: 0.57-0.85).
Conclusions: Recent versions of quantitative imaging devices perform equally well for the detection of early perimetric glaucoma. However, their sensitivities remain fair at high levels of specificity.
References:
1. Greaney MJ, Hoffman DC, Garway-Heath DF, Nakla M, Coleman AL, Caprioli J. Comparison of optic nerve imaging methods to distinguish normal eyes from those with glaucoma. Invest Ophthalmol Vis Sci. 2002;43:140-5. **2.** Medeiros FA, Zangwill LM, Bowd C, Weinreb RN. Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and stratus OCT optical coherence tomograph for the detection of glaucoma. Arch Ophthalmol. 2004;122:827-37. **3.** Zangwill LM, Bowd C, Berry CC, Williams J, Blumenthal EZ, Sanchez-Galeana CA, Vasile C, Weinreb RN. Discriminating between normal and glaucomatous eyes using the Heidelberg Retina Tomograph, GDx Nerve Fiber Analyzer, and Optical Coherence Tomograph. Arch Ophthalmol. 2001;119:985-93. **4.** Correnti AJ, Wollstein G, Price LL, Schuman JS. Comparison of optic nerve head assessment with a digital stereoscopic camera (discam), scanning laser ophthalmoscopy, and stereophotography. Ophthalmology. 2003;110: 1499-505. **5.** Schuman JS, Wollstein G, Farra T, Hertzmark E, Aydin A, Fujimoto JG, Paunescu LA. Comparison of optic nerve head measurements obtained by optical coherence tomography and confocal scanning laser ophthalmoscopy. Am J Ophthalmol. 2003;135:504-12.

P125 SPECIFICITY AND SENSITIVITY IN DIAGNOSE OF GLAUCOMA BY SCANNING LASER POLARIMETER WITH VARIABLE CORNEAL COMPENSATION

YJ Jiang, XD Duan, ZL Luo
Hunan Xiangya Hospital, Changsha, China

Objective: To evaluate the usefulness of the scanning laser polarimeter with variable corneal compensation (GDxVCC) for glaucoma detection in a Chinese population, and to investigate the retinal nerve fiber layer (RNFL) thickness difference between normal subjects and glaucoma patients.
Design: Prospective comparative cases series.
Methods: Thirty six eyes of 36 normal subjects, 33 eyes of 33 primary chronic angle-closure glaucoma patients, 27 eyes of 27 primary acute angle-closure glaucoma and 36 eyes of 36 primary open-angle glaucoma patients were studied. The glaucoma patients were age-matched with the normal. The thickness of retinal nerve fiber layer was measured with GDxVCC. An eye was diagnosed as glaucoma, if one of the parameters showed P<0.05 on the results of the examination reports including four TSNIT parameters (the average of TSNIT, superior, inferior, and TSNIT Std. Dev.), nerve fiber indicator (NFI) >30, and at least 10 consecutive defects of superpels showed in deviation map (P<0.05).
Results: Twenty two normal eyes (61.1%) were diagnosed as non-glaucoma and 82 glaucomatous eyes (87.4%) were diagnosed as glaucoma by GDxVCC. Sensitivity of the average of TSNIT, superior, inferior, TSNIT Std.Dev. and NFI were 48.4%, 56.8%, 48.4%, 50.5%, 62.1% respectively and specificity were 97.2%, 100%, 97.2%, 94.4% and 97.2% respectively. Sensitivity and specificity of the deviation map were 86.3% and 61.1%. Sensitivity of detection early, moderate and progression glaucoma by GDxVCC were 77.36%, 95.83%, 100% respectively.
Conclusions: GDxVCC is a valuable technology to detect retinal nerve fiber layer defect in early glaucoma. It is shown that the NFI has highest sensitivity.

P126 NERVE FIBER LAYER MEASUREMENTS USING THE GDX VCC IN MONKEYS

C.A. Rasmussen, J.C. Peterson, B.A. Hennes, B.T. Gabelt, P.L. Kaufman
Universtiy of Wisconsin, Madison, WI, United States of America

Purpose: To determine the feasibility of using the GDx VCC system with monkeys and to evaluate reproducibility.
Methods: One normal eye from each of nine cynomolgus monkeys was studied. Monkeys were anesthetized with a combination of intra-muscular ketamine and medetomidine, followed by inhalation isoflurane. Monkeys were maintained at, or near, surgical anesthetic depth for the scanning procedure. IOP (Goldmann applanation tonometer), corneal curvature (Reichert keratometer) and refraction (Hartinger-coincidence) were measured at each session. Slit lamp exams were performed monthly. A 10mm plano contact lens was applied to ensure adequate corneal hydration. Refraction and curvature measurements were repeated after application of the lens and values entered into the patient focal correction field. A motorized head-holder with remote control was used to make fine adjustments in position to facilitate matching alignment to the baseline image. A GDx1 VCC prototype system (Laser Diagnostic Technology, San Diego, CA) was used to acquire nerve fiber layer (NFL) thickness measurements. Corneal compensation was calculated at baseline and verified by 3 or more compensated macular scans at each time point. A new compensation was calculated if retardance or corneal axis values were variable or if image quality was poor. During each session, three to five separate peripapillary scans were taken and a mean created. The scan head was realigned between scans to generate discrete images. Ellipse size was kept constant by entering the specific horizontal and vertical radius values for each animal in the edit ellipse field. Intervals during which subjects were scanned three or four times over 22 to 36 days were used to measure variability for the parameters.
Results: In eyes that were consistently clear at the slit lamp exams (no lens opacities, edema, KP etc), GDx-VCC parameters of average thickness, superior integral, ellipse average, superior average, and inferior maximum had the lowest coefficient of variation: 3.4, 3.5, 3.5, 4.1, 5.2% respectively. Ratio parameters superior ratio, inferior ratio and superior/nasal ratio had values of 7.1, 10.7, and 10.2% respectively. Modulation parameter values were the most variable, ranging from 11.6 to 15.7%. Other parameters ranged from 5.4 to 7.9%.
Conclusions: Collecting multiple, discrete intrasession scans and creating a mean of those values can help compensate for intersession measurement variation inherent to the GDx1 VCC in monkeys.

References:
1. Reus NJ, Lemij HG. Diagnostic accuracy of the GDx VCC for glaucoma. Ophthalmology. 2004 Oct;111(10):1860-5. **2.** Zangwill LM , Bowd C, Berry CC, *et al* . Discriminating between normal and glaucomatous eyes using the Heidelberg Retina tomography, GDx Nerve Fiber Analyzer, and Optical Coherence Tomograph. Arch Ophthalmol 2001; 119 :985–93

P127 AGREEMENT AMONG THREE OPTICAL IMAGING METHODS FOR THE ASSESSMENT OF OPTIC DISK TOPOGRAPHY

E. Hoffmann[1], C. Boyd[1], L.M. Zangwill[1], C. Boden[1], F.H. Grus[2], R.R. Bourne[1], R.N. Weinreb[1]
[1]University of California of San Diego, La Jolla, CA, United States of America, [2]Univerity of Mainz, Mainz, Germany

Introduction: Assessment of optic disk topography is essential for diagnosis and management of glaucoma[1-5].Several optical imaging methods are currently employed in clinical practice to obtain quantitative stereometric and volumetric information of the optic disk[4,5]. Each of these instruments can detect glaucoma with high reproducibility. Although these instruments measure similar characteristics of the optic disk topography, their measurements may not be interchangeable.
Purpose: To assess the agreement of disk topography measurements among Heidelberg Retina Tomograph (HRT II), Retinal Thickness Analyzer (RTA), and the Optical Coherence Tomograph (Stratus OCT).
Methods: Forty-two randomly chosen eyes of 42 subjects (23 glaucoma patients, and 19 normal subjects) were included. Each subject underwent HRT II, RTA, and Stratus OCT examination. Two experienced examiners drew the contour lines for HRT and RTA while viewing simultaneous stereophotographs. A multivariate analysis of variance with mixed model was used to assess agreement between the instruments.
Results: No significant difference in mean disk area was found among the instruments, although HRT tended to measure smaller values compared to RTA and OCT (ANOVA, P = 0.15). RTA measured significantly larger cup disk ratios (Tukey HSD, P < 0.05) and cup volumes (Tukey HSD, P < 0.05), and smaller rim volumes (Tukey HSD, P< 0.05) than HRT and OCT. Instrument variability was increased in glaucoma patients compared with normal subjects. Spearman's coefficient of rank correlation (r) between the instruments ranged from r = 0.35 (Rim Area, HRT *versus* Stratus OCT) to r = 0.91 (Cup Area, HRT *versus* RTA). All correlations were statistically significant.
Conclusions: Measurements of optic disk topography using these three instruments can show significant differences, particularly in glaucoma patients. These instruments should not be used interchangeably to obtain measurements of the optic disk for glaucoma diagnosis or to monitor progression.
References:
1. Caprioli J, Miller JM. Optic disc rim area is related to disc size in normal subjects. Arch Ophthalmol. 1987;105:1683-5. **2.** Jonas JB, Bergua A, Schmitz-Valckenberg P, Papastathopoulos KI, Budde WM. Ranking of optic disc variables for detection of glaucomatous optic nerve damage. Invest Ophthalmol Vis Sci. 2000;41:1764-73. **3.** Garway-Heath DF, Hitchings RA. Quantitative evaluation of the optic nerve head in early glaucoma. Br J Ophthalmol. 1998;82:352-61. **4.** Schuman JS, Hee MR, Arya AV *et al.* Optical coherence tomography: a new tool for glaucoma diagnosis. Curr Opin Ophthalmol. 1995;6:89-95.

P128 OPTIC NERVE HEAD MEASUREMENTS USING OPTICAL COHERENCE TOMOGRAPHY AND CONFOCAL SCANNING LASER OPHTHALMOSCOPY

M. Tavares, M.Y. Endo, L.M Guedes, A.A. Barbosa, L.A.S. Melo, P.A. Mello
Federal University of Sao Paulo, Sao Paulo, Brazil

Introduction: Recent improvements in the OCT software have made possible the evaluation of optic nerve head (ONH) topography[1,2]. A previous investigation demonstrated that OCT ONH measurements correlate well with topographic measurements obtained by confocal scanning laser ophthalmoscopy[3]. However, another one concluded that measurements of ONH topography using these instruments can show significant differences, and that they should not be used interchangeably to obtain measurements of the ONH[4].
Purpose: To compare and correlate optic nerve head (ONH) measurements obtained by Optical Coherence Tomography (Stratus OCT; Carl Zeiss Meditec, Dublin, CA, USA) and Heidelberg Retina Tomograph (HRT II; Heidelberg Engineering, Dossenheim, Germany).
Methods: One eye of each 23 normal individuals were included. The Fast Optical Disk scanning protocol was used to obtain ONH measurements with Stratus OCT. For the HRT, a mean topography image of three scans was created with its software (version 2.01). The parameters disk area, rim area, cup area and cup/disk area ratio were compared and correlated.
Results: The means (standard deviation) of Disk Area, Rim Area, Cup Area, and Cup/Disk Area Ratio for the OCT were 2.45 (0.56), 1.64 (0.58), 0.81 (0.80) and 0.28 (0.25) mm2, respectively; and for the HRT they were, respectively, 2.24 (0.65), 1.65 (0.33), 0.59 (0.44) and 0.24 (0.13) mm2. Only Disk Area obtained by OCT was significantly different (larger; P=0.02). Correlations between Disk Area (r=0.75), Rim Area (r=0.07), Cup Area (r=0.54) and Cup/Disk Area Ratio (r=0.28) obtained by OCT and HRT were weak to moderate.
Conclusions: Differences in ONH measurements with Stratus OCT and HRT II were demonstrated, as well as weak correlations among parameters when obtained by both devices. Results suggest incompatibility between the two instruments when evaluating ONH topography.
References:
1. Medeiros FA, Zangwill LM, Bowd C, Vessani RM, Susanna R Jr, Weinreb RN. Evaluation of retinal nerve fiber layer, optic disc nerve head, and macular thickness measurements for glaucoma detection using optical coherence tomography. Am J Ophthalmol 2005;139:44-55. **2.** Savini G, Zanini M, Carelli V, Sadun AA, Ross-Cisneros FN, Barboni P. Correlation between retinal nerve fibre layer thickness and optic nerve head size: an optical coherence tomography study. Br J Ophthalmol. 2005;89:489-92. **3.** Schuman JS, Wollstein G, Farra T, Hertzmark E, Aydin A, Fujimoto JG, Paunescu LA. Comparison of optic nerve head measurements obtained by optical coherence tomography and confocal scanning laser ophthalmoscopy. Am J Ophthalmol 2003; 135:504-512. **4.** Hoffmann EM, Bowd C, Zangwill LM, Boden C, Grus FH, Bourne RR, Weinreb RN. Agreement among three optical imaging methods for the assessment of optical disk topography. Ophthalmology 2005 (forthcoming).

P129 RETINAL NERVE FIBER THICKNESS MEASUREMENT USING GDX WITH ENHANCED CORNEAL COMPENSATION

A. Tomidokoro, H. Saito, G. Tomita, M. Aihara, M. Araie
University of Tokyo, Tokyo, Japan

Objective: GDx with Enhanced Corneal Compensator (GDx ECC) is a new program designed to make more accurate measurements of the retinal nerve fiber layer thickness (RNFLT) compared to the former program, GDx with Variable Corneal Compensator (GDx VCC). With the ECC program, following the VCC procedure, the retardation of the polarized laser beam is further corrected by enhancing the reflected laser beam according to RNFLT in order to diminish noise factors often seen in areas of thin nerve fiber layer. In this cross sectional study, GDx ECC was compared to GDx VCC as to the measurements of RNFLT and its correlation with the degree of visual field damage.
Methods: The RNFLT of 50 open angle glaucoma (OAG) eyes was measured with GDx ECC and VCC simultaneously, and its correlation with the mean deviation (MD) of the Humphrey Central 30-2 SITA standard program was determined.
Results: In 50 OAG eyes, there was no significant difference between the RNFLT measured with GDx ECC and that with VCC, with showing good correlation with each other (R=0.92, P<0.0001). Both the RNFLT measured with ECC and that with VCC significantly correlated with MD (ECC: R=0.60, P<0.0001, VCC: R=0.51, P=0.002). In 20 with myopia (<-3 diopters) out of the 50 OAG eyes, significant correlation between RNFLT and MD was seen only in the ECC measurement (ECC: R=0.57, P=0.0081, VCC: R=0.39, P=0.090), while in the other 30 eyes there was significant correlation between RNFLT and MD in both the ECC and VCC measurements (P<0.05).
Conclusions: There were no significant differences in the measurements of GDx ECC and VCC in general. However, when limited to myopic eyes in which the retina should be relatively thin, better correlation with degree of visual field damage was seen in measurements with ECC than in those with VCC. GDx ECC should provide more accurate measurements of RNFLT in eyes with thinner retina, such as myopic eyes or advanced glaucoma eyes.
Reference:
1. Zhou Q, Weinreb RN. Individualized compensation of anterior segment birefringence during scanning laser polarimetry. Invest Ophthalmol Vis Sci. 2002 Jul;43 (7):2221-8

P131 OPTICAL COHERENCE TOMOGRAPHY ASSESSMENT OF MACULAR AND RETINAL NERVE FIBER LAYER THICKNESS CHANGES AFTER MEDICAL TREATMENT TO REDUCE INTRAOCULAR PRESSURE

N. Yuksel, S. Tanidir, O. Elibol, S. Karadag, Y. Çaglar
Kocaeli University School of Medicine, Izmir/Kocaeli, Turkey

Introduction: The reduction in intraocular pressure (IOP) in glaucoma patients may result in a decrease of glaucomatous damage to the optic nerve head and retinal nerve fiber layer (RNFL).
Purpose: To investigate the changes in retinal nerve fiber layer (RNFL) and macular thickness using optical coherence tomography (OCT) after intraocular pressure (IOP) decrease in new glaucoma patients.
Design: Prospective observational case series.
Parcipitants: Twenty-four eyes of 18 new glaucoma patients who have high IOP and were medically untreated before drug administration.
Methods: Eyes were imaged using OCT on the day before and after receiving an acetazolamide tablet to decrease IOP. After that procedure; each patient received topical treatment for glaucoma based on clinical examinations. Patients were imaged again using OCT 1-2 months after receiving topical treatment.
Results: Mean IOP (27.64 ± 4.42mmHg) decreased significantly after receiving acetazolamide and topical treatment. Mean IOP reduction was 8.68 ± 2.70 mmHg and 9.72 ± 3.86 mmHg respectively. We observed a mean overall RNFL thickness increase in 16 of 24 eyes (66.6%) after receiving acetazolamide and 14 of 24 (58.3%) eyes after receiving topical treatment. In segmental analysis, there was a statistically significant increase of RNFL thickness in the superior quadrant after both treatments. The mean RNFL thickness increase was significantly collerated with the IOP reduction after receiving acetazolamide. No statistically significant changes in mean macular thickness were observed.
Conclusions: RNFL thickness can be partially increased after IOP reduction in glaucoma patients.
References:
1. Guadenez V, Schuman JS, Hertzmark MA *et al.* Optical coherence tomography measurement of macular and nerve fiber layer thickness in normal and glaucomatos eyes. Ophthalmology 2003;110:177-189. **2.** Bowd C, Weinreb RN, Lee B. *et al.* Optic disk topography after medical treatment to reduce intraocular pressure. Am J Ophthalmol 2000;130:280-286. **3.** Tan JCH, Hitchings. Reversal of disc cupping after intraocular pressure reduction in topographic image series. J Glaucoma 2004;13:351-355. **4.** Aydin A, Wollstein G, Price LL. Optical coherence tomography assessment of retinal nerve fiber layer thickness changes after glaucoma surgery. Ophthalmology 2003;110:1506-1511. **5.** Lesk MR, Spaeth GL, Azuara-Blanco A. *et al.* Reversal of optic disc cupping after glaucoma surgery analyzed with a scanning laser tomography. Ophthalmology 1999;106:1013-1018.

P132 OPTIC CUP-TO-DISC RATIO MEASUREMENT BY INDIRECT OPHTHALMOSCOPY, DIGITAL PHOTOGRAPHY AND STRATUS OCT

M.F. Domingues, D. Meira, H. Monteiro, F. Matos, F. Falcão-Reis
Department of Ophthalmology, Oporto Medical School – S. João Hospital, Porto, Portugal

Purpose: To compare monoscopic digital photography optic cup-to-disc ratio measurements with Stratus OCT and stereoscopic 60D indirect lens ophthalmoscopy results.
Participants and methods: We retrospectively revised 485 eyes (243 subjects) from a glaucoma clinic at S. João Hospital (24-82 years old, mean 62.7). Participants had routine ophthalmologic examination, dilated ophthalmoscopy (60D), digital photography (Photo), Humphrey standard 30-2 achromatic automated perimetry (VF) and Stratus OCT scanning within the same month. Pearson age-adjusted correlation was determined between the procedures. Bland and Altman scatter plots of the differences of two measurements against their average were also created to assess agreement among methods.
Main outcome measures: OCT, monoscopic digital photography and 60D indirect ophthalmoscopic vertical and horizontal cup-to-dic ratios.
Results: Pearson coefficients of correlation between Stratus OCT cup-to-disc ratio measurements and monoscopic digital photography for horizontal and vertical cup-to-disc ratios were 0.73 and 0.80, p<0.0001, respectively. The correlation between OCT and stereoscopic 60D indirect lens ophthalmoscopy results was slightly inferior.
Conclusion: We found a significant correlation between Stratus OCT cup-to-disc ratio measurements and monoscopic digital photography and stereoscopic 60D indirect lens ophthalmoscopy results.
References:
1. Lichter PR. Variability of expert observers in evaluating the optic disc. Trans Am Ophthalmol Soc. 1976;74:532-72. **2.** Tielsch JM, Katz J, Quigley HA, Miller NR, Sommer A. Intraobserver and interobserver agreement in measurement of optic disc characteristics. Ophthalmology. 1988 Mar;95(3):350-6. **3.** Shuttleworth GN, Khong CH, Diamond JP. A new digital optic disc stereo camera: intraobserver and interobserver repeatability of optic disc measurements. Br J Ophthalmol. 2000 Apr;84(4):403-7 **4.** Parkin B, Shuttleworth G, Costen M, Davison C. A comparison of stereoscopic and monoscopic evaluation of optic disc topography using a digital optic disc stereo camera. Br J Ophthalmol. 2001 Nov;85(11):1347-51.

P133 COMPARISON OF STRATUS OCT PARAMETERS TO DETECT GLAUCOMATOUS DAMAGE

R.M. Vessani[1], M. Hatanaka[2], R. Susanna[3]
[1]Hospital das Clínicas, São Paulo, Brazil, [2]Marcelo, São Paulo, Brazil, , São Paulo, Brazil

Introduction: Optical coherence tomography can provide objective assessment of the optic nerve head, RNFL and macular thickness in normal and glaucomatous eyes. The new version, StratusOCT (Carl Zeiss Meditec, Inc, Dublin, CA, USA) includes several improvements compared with the original instrument.
Aim of study: To evaluate and compare the ability of peripapillary RNFL measurements, macular thickness measurements and optic disc measurements by Stratus OCT to discriminate between healthy and glaucomatous eyes.
Methods: Cross sectional observational analysis of twenty-seven patients with glaucomatous visual field loss and 35 healthy subjects with similar age. RNFL thickness measurements, macular thickness measurements and optic disc measurements were obtained from all subjects by im-

aging with 'Fast RNFL thickness(3.4)', 'Fast Macular Thickness Map' and 'Fast Optical Disc' scan protocols of the StratusOCT. Visual field testing was perfomed in all subjects within a 6-month period. Average MD (± SD) of the visual field tests of glaucomatous patients was -6.60 ± 5.68 dB. ROC curves and sensitivities at fixed specificities were calculated for parameters reported as continuous variables on the clinical printout of each scan protocol of the instrument.
Results: Area under the ROC curve (AUC) was higher for mean RNFL thickness (0.93), vertical integrated rim area (0.92) and horizontal integrated rim width (0.92) and RNFL thickness measured at 6 o'clock (0.92). The best Macular Thickness Map parameter, superior outer macula, showed significantly lower AUC (0.79) compared to previous parameters.
Conclusions: Peripapillary RNFL and optic disc parameters provide better performance than macula thickness parameters to differentiate glaucomatous from normal eyes.

P134 VARIABILITY OF NEURORETINAL RIM AREA MEASUREMENTS IN NORMAL AND GLAUCOMA PATIENTS USING RTA AND OCT3
P.G. Schlottmann, J.M. Shewry, F.C. Ikeji, E.T. White, D.F. Garway-Heath
Moorfields Eye Hospital, London, United Kingdom

Introduction: Measurements repeatability should be sufficient to permit change detection in longitudinal follow up.
Purpose: To evaluate variability of neuroretinal rim area measurements in normal subjects and glaucoma patients by Retinal Thickness Analyzer (RTA) and Optical Coherence Tomography (OCT).
Design: cross sectional, instrument validation study.
Methods: One eye was randomly selected from each of 25 normal subjects and 31 glaucoma patients and scanned using OCT3 and RTA. Glaucoma diagnosis was based on visual field repeatable defects. Eyes were imaged by two experienced observers over two visits. Time between visits ranged from one to three weeks. Repeatability for Rim Area measurements was calculated for observer one and two, and visits one and two by means of Bland & Altman plots[1] and Intraclass Correlation Coefficient (ICC)[2] for the sequences interobserver-intravisit (1 – 2, 1'– 2'), interobserver-intervisit (1'– 2, 1 – 2') and intraobserver-intervisit (2 – 2', 1–1'). OCT scans were acquired using the Fast Optic Disc scan protocol and analysed with the Optic Nerve Head protocol [3]. No corrections were made to the automatic recognition of the disc borders. RTA scans[4] were reviewed for image quality by a masked observer. Four images were excluded from the analysis.
Main outcome measures: Rim area measurements variability.
Results: The ICC values for Rim Area measurements for the sequence (1 – 2, 1'– 2'), (1'– 2, 1 – 2') and (2 – 2', 1–1') with the OCT were 0.907, 0.894 and 0.912 respectively. The mean differences between measures (95% limits of agreement) for the same sequence were 0.06 (-0.01 to 0.13), -0.03 (-0.10 to 0.05) and 0.06 (-0.01 to 0.13). OCT Disc Area ICC ranged from 0.70 to 0.79. For the RTA the ICC values for Rim Area measurements for the same sequence were 0.894, 0.899 and 0.879. Mean difference between measures were 0.03 (-0.04 to 0.10), -0.03 (-0.10 to 0.05) and -0.01 (-0.10 to 0.07). RTA Disc Area ICC ranged from 0.80 to 0.81.
Conclusions: The RTA measurements show comparable reproducibility to OCT measurements. The RTA used a different contour line for each observer, potentially adding variability. OCT contour line drawing is performed automatically by the software, but the variability in Disc Area calculation may affect the reproducibility of the Rim Area measurements. Image quality may be a further source of variability as the automatic disc area detection will be impaired. As Rim Area is related to Disc Area[5], any variability of this measurement will induce variability on rim area calculations. The use of a fixed, transferable contour line may reduce variability on rim area measurements.
References:
1. Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. Lancet. 1986 Feb 8;1(8476):307-10. **2.** Weir JP. Quantifying Test-Retest Reliability Using the Intraclass Correlation Coefficient and the SEM. J Strength Cond Res. 2005 Feb;19(1):231-40. **3.** Stratus OCT Manual. Carl Zeiss Meditec Inc. **4.** RTA manual. Talia Technologies. **5.** Budde WM, Jonas JB, Martus P, Grundler AE. Influence of optic disc size on neuroretinal rim shape in healthy eyes. J Glaucoma. 2000 Oct;9(5):357-62.

P135 DIAGNOSTIC & CORRELATION ANALYSIS OF STRATUS OCT AND GDX VCC RETINAL NERVE FIBER LAYER (RNFL) MEASUREMENTS
C.K.-S. Leung[1], W.M. Chan[2], K.L. Chong[2], J. Woo[1], K.K. Tse[1]
[1]Caritas Medical Centre, Sham Shui Po, Hongkong, [2]The Chinese University of HK, Shatin, Hongkong

Purpose : To evaluate the diagnostic performance and correlations of RNFL thickness measured by StratusOCT and GDx VCC
Design: Cross-sectional study.
Participants: A total of 89 subjects with 27 normal and 62 glaucoma-suspect / glaucoma eyes were included.
Methods: Total average and mean 12 clock-hour RNFL thickness were measured with Stratus OCT and GDx VCC. The discriminating power for detection of glaucoma-suspect and glaucoma was analyzed with the area under the receiver operating characteristic curves (AUC). The correspondence of the respective RNFL measurements was studied with linear regression analysis.
Results: For StratusOCT, the average RNFL thickness in the normal and glaucoma suspect / glaucoma groups were 101.38 ± 7.73µm and 76.04 ± 20.13µm respectively whereas for GDx VCC, they were measured respectively at 55.26 ± 4.32µm and 43.50 ± 9.72µm. The GDx VCC superior RNFL measurement demonstrated the largest AUC (0.909) for detection of glaucoma suspect and glaucoma while the largest AUC (0.901) in Stratus OCT was found over the 7 o'clock (corresponding to the inferotemporal sector) (Table 1). The total average RNFL thickness measured with StratusOCT and GDx VCC were highly correlated with each other (r=0.852). When the respective clock hour RNFL measurements were compared, the coefficient of correlation varied with the position around the optic nerve head with the highest correlation found over the superior and inferior clock hours (11,12,1,6 and 7o'clock; all with r>0.700) and the lowest located at the temporal clock hour (9 o'clock; r=0.277) (Table 2).
Conclusions: Both StratusOCT and GDx VCC demonstrated comparable diagnostic performance for detection of glaucoma suspect and glaucoma. Despite the substantial differences in the values of the RNFL thickness, high correlations were observed between StratusOCT and GDx VCC measurements. The lower coefficient of correlation over the temporal and nasal sectors of the optic disc is likely secondary to the higher variability in measuring RNFL thickness (reported in previous studies) over these regions.
References:
1. Medeiros FA, Zangwill LM, Bowd C, *et al.*Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and stratus OCT optical coherence tomograph for the detection of glaucoma. Arch Ophthalmol.2004;122:827-37. **2.** Carpineto P, Ciancaglini M, Zuppardi E, *et al.* Reliability of nerve fiber layer thickness measurements using optical coherence tomography in normal and glaucomatous eyes. Ophthalmology. 2003;110: 190-5. **3.** Gurses-Ozden R, Teng C, Vessani R, *et al.* Macular and retinal nerve fiber layer thickness measurement reproducibility using optical coherence tomography (OCT-3). J Glaucoma.2004 Jun;13:238-44. **4.** Kook MS, Sung K, Park RH, *et al.* Reproducibility of scanning laser polarimetry (GDx) of peripapillary retinal nerve fiber layer thickness in normal subjects. Graefes Arch Clin Exp Ophthalmol.2001;239(2):118-21. **5.** Hoh ST, Ishikawa H, Greenfield DS, *et al.* Peripapillary nerve fiber layer thickness measurement reproducibility using scanning laser polarimetry. J Glaucoma.1998;7:12-5.

P136 DETECTION OF GLAUCOMATOUS DAMAGE WITH OPTICAL COHERENCE TOMOGRAPHY (STRATUS OCT 3000)
J.M. Larrosa, V. Polo, A. Ferras, C. Mayoral, V. Pueyo, F.M. Honrubia
Hospital Universitario Miguel Servet, Zaragoza, Spain

Aim of the study: To compare the thickness of retinal nerve fiber layer (RNFL) measured by optical coherence tomography (OCT) and to evaluate the sensitivity and specificity of the different parameters to discriminate between normal and glaucomatous eyes.
Methods: Fifty-six normal subjects, 70 ocular hypertensives, 62 glaucoma suspects and 42 glaucomatous patients were included in the study. Average and segmental (quadrants and clock hours) RNFL thickness values were compared among all the groups. The receiver operating characteristic curves (ROC) were plotted to obtain the diagnostic value of the different RNFL thickness parameters.
Results: In glaucomatous eyes, RNFL thickness was significantly thinner than in normal eyes in global RNFL average, in all retinal quadrants and in most 'clock-hour' positions. A significant decrease in the global RNFL average, quadrants and 'clock-hours' segments than involve the superior and inferior 'poles' of the optic nerve head was observed in the glaucoma group compared to the ocular hypertensive and glaucoma suspected eyes. The differences were not significant among normal, ocular hypertensive and glaucoma suspected eyes. The RNFL thickness parameters with larger ROC areas were the RNFL global average thickness, the inferior retinal quadrant and the 5 and 6 hour-positions. At a fixed specificity of 90%, the sensitivity of these RNFL thickness parameters were 52,4%, 45,2%, 50% and 45,2%, respectively.
Conclusions: Quantitative RNFL measurements using OCT showed differences between normal, ocular hypertensive eyes, glaucoma suspected and glaucomatous eyes. Several RNFL thickness parameters measured by means of this device are useful to discriminate glaucomatous damage.
References:
1. Sanchez-Galeana C, Bowd C, Blumenthal EZ, Gokhale PA, Zangwill LM, Weinreb RN. Using optical imaging summary data to detect glaucoma. Ophthalmology. 2001 Oct;108(10):1812-8. **2.** Medeiros FA, Zangwill LM, Bowd C, Weinreb RN. Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and stratus OCT optical coherence tomograph for the detection of glaucoma. Arch Ophthalmol. 2004 Jun;122(6):827-37. **3.** Zangwill LM, Bowd C, Berry CC, Williams J, Blumenthal EZ, Sanchez-Galeana CA, Vasile C, Weinreb RN. Discriminating between normal and glaucomatous eyes using the Heidelberg Retina Tomograph, GDx Nerve Fiber Analyzer, and Optical Coherence Tomograph. Arch Ophthalmol. 2001 Jul;119(7):985-93.

P137 STRATUS-OCT IMAGING IN EARLY PRIMARY OPEN-ANGLE GLAUCOMA AND OCULAR HYPERTENSION EYES WITH AND WITHOUT FDT DEFECTS
P. Brusini[1], M.L. Salvetat[1], M. Zeppieri[2], C. Tosoni[1], L. Parisi[1], M. Felletti[2]
[1]Santa Maria della Misericordia Hospital, Udine, Italy, [2]Dept. of Ophth.-Univ. of Udine, Udine, Italy

Purpose: To compare Stratus-OCT measurements in normal subjects, ocular hypertensive (OHT) patients, and in patients affected with early primary open-angle glaucoma (POAG).
Design: Observational case series.
Participants: Seventy-nine healthy subjects, 82 OHT patients and 90 early POAG patients.
Methods: All the subjects underwent standard automated perimetry (SAP, HFA 30-2 test), frequency doubling technology (FDT) N-30 threshold test and Stratus-OCT imaging, within a period of 4-months. One eye per patient was considered. Stratus-OCT retinal nerve fiber layer (RNFL) and optic nerve head (ONH) scans were performed, using the Fast RNFL Thickness 3.46 and Fast Optical Disc protocols, respectively. Differences amongst groups were evaluated using the Kruskal-Wallis and the Mann-Whitney tests. The area under the receiver operating characteristic curve (AROC) for discriminating between healthy and glaucomatous eyes was calculated for each Stratus-OCT-parameter. SAP test results were considered as the gold standard.
Main outcome measures: Optic disc and RNFL abnormalities.
Results: Statistically significant differences were found when comparing normal, OHT and POAG eyes for all of the 8 'ONH analysis report' parameters, and for 8 of the 13 'RNFL thickness average analysis report' parameters. Five parameters of the 'ONH analysis report' were significantly different between OHT eyes with an abnormal FDT test (42 eyes) and OHT eyes with a normal FDT test (40 eyes). The AROCs for the Stratus-OCT-parameters ranged between 0.52 and 0.85. Single parameters with the largest AROC were the horizontal integrated rim width (area) for the ONH scans (0.85), and the average thickness for the RNFL scans (0.82).
Conclusions: The Stratus-OCT is able to discriminate between healthy and early glaucomatous eyes. The OHN scan parameters are useful in recognizing very early structural alterations in OHT patients and in early POAG patients.
References:
1. Schuman JS, Hee MR, Puliafito CA, *et al*: Quantification of nerve fiber layer thickness in normal and glaucomatous eyes using optical coherence tomography. Arch Ophthalmol 1995; 113: 586-596. **2.** Kanamori A, Nakamura M, Escano MF, *et al*: Evaluation of the glaucomatous damage on retinal nerve fiber layer thickness measured by optical coherence tomography. Am J Ophthalmol 2003; 135: 513-520. **3.** Mok KH, Lee VW, So KF: Retinal nerve fiber layer measurement by optical coherence tomography in glaucoma suspects with short-wavelength perimetry abnormalities. J Glaucoma 2003; 12: 45-49. **4.** Medeiros FA, Zangwill LM, Bowl C, *et al*: Evaluation of retinal nerve fiber layer, optic nerve head, and macular thickness measurements for glaucoma detection using optic coherence tomography. Am J Ophthalmol 2005; 139: 44-55. **5.** Wollestein G, Ishikawa H, Wang J, Beaton SA, Schuman JS: Comparison of three optic coherence tomography scanning areas for detection of glaucomatous damage. Am J Ophthalmol 2005; 139: 39-43.

P138 PRIORITY OF EARLY GLAUCOMA DEFECTS: ANATOMY AND FUNCTION
M. Gonzalez de la Rosa, M. Gonzalez-Hernandez, V. Lozano-Lopez, R. Rodriguez de la Vega
Universidad de La Laguna, Santa Cruz De Tenerife, Spain

Purpose: To analyze which of these two types of defects occur earlier: anatomical, measured with HRT II or functional, measured with White-White perimetry.
Design: Case series.
Participans and controls: 731 eyes from 731 subjects (72 normal and 659 early and suspected open angle glaucoma (MD<6dB)) were examined with the HRT II and the Octopus 311 perimeter (TOP strategy).
Methods: ROC analysis was used to evaluate diagnostic ability. Step by step multiple regression was used to correlate indices.
Main outcome measure: 102 HRT II indices, TOP's mean sensitivity (MS), mean defect (MD) and square root of loss variance (sLV).
Results: Control subject's age was significantly correlated with MS (r=0.50, p<0.00001) and nasal cup shape measure (r=0.33, p=0.005). For 95% specificity, the best results were obtained with sLV (ROC area=69.7, confidence intervals 65.0-74.4, optimum cut off=2.6dB, sensitivity 33.7%) and Maximum contour elevation (ROC area=69.6 [64.9-74.3], cut off= -0.001, sensitivity=29.0%). Glaucoma diagnosis coincided in 12.4% of cases. All patients with sLV>2.6dB presented two or more pathological points. Global average variability predicted MS with standard error of estimate (SEE)=2.29dB (r=0.31, p<0.0001). Global mean RNFL thickness predicted MD (SEE=1.98dB, r=0.21, p<0.0001). Tmp/inf cup shape measure predicted sLV (SEE=1.02dB, r=0.19, p<0.0001). An equation using 9 HRT II indices predicted MS (SEE=2.08dB, r=0.51, p<0.00001), MD (SEE=1.95dB, r=0.28, p<0.00001) and sLV (SEE=1.00dB, r=0.31, p<0.00001).

Using 64 variables r=0.67 was reached when predicting MS (Figure), but SEE increased little (1.87dB).

Conclusions: Perimetry reflects defects associated to age slightly better. Nasal cup shape measure dependence to age has not been previously described[1]. TOP-sLV sensitivity seems higher than that of HRT II[2,3], but confidence intervals of both ROC areas are overlapped. Only one paper using the Humphrey perimeter[4] was carried out on relatively early glaucoma (MD< 10dB) but no correlation between anatomy and function was found. Those papers which have found significant correlation[5,6,7,8,9,10 and others] have included patients with mild and deep defects. HRT II indices are better correlated with MS than with MD, probably because non of them is age corrected. Good correlation between anatomical and functional data indicates small differences in precocity between both methods. In the contrary, ROC analysis and age correlation slightly favour perimetry precocity.

References:

1. Durukan AH *et al.* Assessment… Clin Experiment Ophthalmol. 2004 Jun;32:259-64. **2.** Gonzalez de la Rosa M *et al.* TOP… In: Reece SM (ed.) Focus on Glaucoma Research. NY. Nova Science (in press). **3.** Gonzalez de la Rosa M *et al.* R. TOP-WW… IPS Meeting, Barcelona; 2004. **4.** Tole DM *et al.* The correlation… Eye. 1998;12:686-90. **5.** Brigatti L *et al.* Correlation… Arch Ophthalmol. 1995;113:1191-4. **6.** Eid TM *et al.* Quantitative… J Glaucoma. 1997;6:221-30. **7.** Iester M *et al.* Correlation… J Glaucoma. 1997;6:78-82. **8.** Mistlberger A *et al.* Heidelberg… Ophthalmology. 1999;106:2027-32. **9.** Sihota R *et al.* Correlation… Eur J Ophthalmol. 200313:266-75. **10.** Nakatsue T *et al.* Optic… J Glaucoma. 2004;13:291-8.

P139 POSITIVE FAMILY HISTORY AND OCULAR HYPERTENSION AS RISK FACTORS FOR PRYMARY OPEN ANGLE GLAUCOMA: RNFL AND MACULA ANALYSIS WITH OCT3

T. Rolle, B. Brogliatti, B. Roagna, F. Tofani, V. Russo, F.M. Grignolo
University of Torino, Torino, Italy

Introduction: Primary open angle glaucoma is a multifactorial optic neuropathy in which there is characteristic acquired loss of optic nerve fibers. A significant axonal loss may precede the development of glaucomatous visual field defects and identifiable cupping.

Aim of the study: To detect early structural glaucomatous changes at the retinal nerve fiber layer (RNFL) and the macula in subjects with risk factors for POAG (ocular hypertension and positive family history - first grade relatives).

Methods: Among 128 subjects with a positive family history of POAG were selected 30 subjects (59 eyes) (14 males and 16 females; mean age 52.2 ± 10.1ys) with IOP>22mmHg (mean IOP 23.4 ± 1.3), normal visual field and normal optic disc appearance. They underwent a complete ophthalmologic examination, central corneal thickness (CCT) measurement. Quantitative analysis of the retinal nerve fiber layer (RNFL) and the macular Thickness/Volume were performed with OCT3. The results were compared with those of 20 normal subjects age and sex matched. The statistical analysis was carried out with Student *t* test, Pearson's correlation coefficient, sensitivity and specificity (AROC); p<0.05 were considered statistically significant.

Results: In eyes of glaucomatous patients relatives significant reduction in the RNFL Thickness values was found (96.8±15.5μ *vs* 118.8±16.7μ;p<0.01); the sector-by-sector analysis showed statistical significant differences in the RNFL thickness in all locations analyzed (p<0.01). No significant differences were found in macular thickness/volume values (global and sector-by-sector analysis) between cases and controls. Significant correlation was found between macular volume and RNFL thickness (r:0.41). RNFL thickness Average produced the largest area under ROC curves (0.79).

Conclusions: In eyes of patients with positive family history for POAG associated to ocular hypertension with normal SAP and normal appearance of optic disc the RNFL is thinner than in normal subjects. The OCT 3 analysis permits an earlier detection of structural glaucomatous damage allowing earlier treatment.

References:

1. Budde WM, Jonas JB. Family history of glaucoma in the primary and secondary open angle glaucomas. Graefes Arch Clin Exp Ophthalmol 1999;237:554-557. **2.** Gasch AT, Wang P, Pasquale LR. Determinants of glaucoma awareness in a general eye clinic. Ophthalmology 2000;107:303-308. **3.** Gordon MO, Beiser JA, Brandt JD, *et al.*The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;6:714-720 **4.** Kass MA,Heuer DK,Higginbotham EJ, *et al.* The ocular Hypertension Treatment study: a randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary open-angle glaucoma.Arch. Ophthalmol 2002; 120:701-713 **5.** Landers J, Goldberg I,Graham S. Factors awareness and knowledge of glaucoma. Clin Exp Ophthalmol 2002;30:104-109 **6.** Landers J, Goldberg I, Graham SL. Analysis of risk factors that may be associated with progression from oct hypertension to primary open angle glaucoma. Clin Experiment Ophthalmol. 2002 Aug;30(4);242-7 **7.** Mc Naught A, *et al.* Accuracy and implications of a reported family history of glaucoma: experience from the Glaucoma Inheritance Study in Tasmania (GIST). Arch Ophthalmol 2000;118:900-904 **8.** Shin DH, Becker B, Kolker AE. Family history in primary open-angle glaucoma. Arch ophthalmol. 1997 Apr;95(4):598-600 **9.** Tielsch JM,Kats J, Sommer A,Quiglei HA, Javitt JC. Family history and risk of primary open-angle glaucoma. The Baltimore Survey. Arch Ophthalmol. 1994 Jan; 112(1):69-73 **10.** Uhm K-B, Shin DH. Positive family history of glaucoma is a risk factor for increased IOP rather than glaucomatous optic nerve damage (POAG *vs* OH *vs* normal control). Korean J Ophthalmol 1992;6:100-104 **11.** Uhm KB, Shin DH. Glaucoma risk factors in primary open-angle glaucoma patients compared ocular hypertensives and control subjects. Korean J Ophthalmol. 1992 Dec;6(2):91-9

P140 REPRODUCIBILITY OF STRATUS OPTICAL COHERENCE TOMOGRAPHY MEASUREMENTS

M.F. Domingues, H. Monteiro, A. Quintas, F. Falcão-Reis
Department of Ophthalmology, Oporto Medical School – S. João Hospital, Porto, Portugal

Purpose: To evaluate the reproducibility of repeated quantitative assessment of optic nerve head topography and retinal nerve fiber layer thickness in normal and glaucomatous eyes with and without pupillary dilation.

Participants and methods: A total of 10 glaucomatous eyes and 10 normal eyes were included in the study. Nerve fiber layer thickness, macular volume and optic nerve head parameters were automatically determined in three consecutive exams (intrassession) and in three consecutive days (intersession), with and without pupillary dilation. Coefficients of variability were elaborated.

Main outcome measures: Coefficients of variability.

Results: Coefficients of variability in normal eyes measurements (0.2 to 12.1%) were not statistically different from glaucomatous eyes measurements (0.9 to 16.7%). Coefficients of variability of the data obtained with and without pupillary dilation were not statistically different.

Conclusion: Independently from pupillary dilation, Stratus optical coherent tomography presents low intra- and intersession coefficients of variability in nerve fiber layer thickness measurements and optic nerve head topographic assessment of normal and glaucomatous eyes.

References:

1. Paunescu LA, *et al.*: Reproducibility of nerve fiber layer thickness, macular thickness, and optic nerve head measurements using stratus OCT. Invest Ophthalmol Vis Sci. 2004 Jun; 45(6):1716-24

P141 RETINAL NERVE FIBER LAYER THICKNESS MEASUREMENTS USING STRATUS OCT: GLAUCOMA DAMAGE EVALUATION

M.F. Domingues, H. Monteiro, P. Costa, F. Matos, F. Falcão-Reis
Department of Ophthalmology, Oporto Medical School – S. João Hospital, Porto, Portugal

Purpose: To evaluate and compare the thickness of retinal nerve fiber layer (RNFL) measured by Stratus optical coherence tomography in normal, ocular hypertensive, glaucoma suspect and glaucomatous eyes.

Participants and methods: A total of 66 normal eyes, 130 ocular hypertensive eyes, 220 glaucoma suspects and 106 glaucomatous eyes were enrolled in the study. Subjects were classified into diagnostic groups based on intraocular pressure, stereoscopic ophthalmoscopy and standard automated perimetry (SAP). Three 3.4 mm-diameter circular scans centered on the optic disc were obtained for each eye with Stratus OCT. Average and segmental RNFL values were compared among all the groups.

Main outcome measures: Average and segmental RNFL.

Results: Average RNFL thickness was significantly thinner in glaucomatous eyes (71.7 ± 18.3μm) than in normal (96.9 ± 11.7μm, p<0.0001), ocular hypertensive eyes (90.2 ± 14.2μm, p<0.0001) and glaucoma suspect eyes (92.2 ± 14.5μm, p<0.0001). Average, inferior and superior segmental RNFL results were significantly different among the four groups.

Conclusion: Quantitative RNFL measurements using Stratus OCT showed differences between normal, ocular hypertensive and glaucoma suspect and glaucomatous eyes.

References:

1. Medeiros FA, Zangwill LM, Bowd C, Vessani RM, Susanna R Jr, Weinreb RN: Evaluation of retinal nerve fiber layer, optic nerve head, and macular thickness measurements for glaucoma detection using optical coherence tomography. Am J Ophthalmol. 2005 Jan;139(1):44-55.

P142 THE DIAGNOSTIC PRECISION OF PREPERIMETRIC GLAUCOMA WITH CORRECTED NORMATIVE DATABASE IN KOREAN

J.M. Kim[1], K.H. Park[2], S.H. Kang[2], J. Seo[2], T.W. Kim[3], D.M. Kim[2]
[1]Kangbuk Samsung Hospital, Seoul, South-Korea, [2]Seoul National University, Seoul, South-Korea
[3]Bundang SNU Hospital, Keonggi-do, South-Korea

Purpose: To establish corrected normative database of retinal nerve fiber layer (RNFL) thickness in Korean and evaluate the usefulness of the database to detect early glaucoma.

Design: Cross-sectional study.

Participants: A total of 42 normal Koreans were analyzed. No one showed any glaucomatous optic nerve change, field defect, or high intraocular pressure.

Methods: The OCT, red free RNFL photography, disc photography, and standard automated perimetry results of 42 normal Koreans were analyzed. The OCT measurements were taken with the 'Fast RNFL Thickness' mode of STRATUSOCT, a high resolution tomographic device (Carl Zeiss Meditec, Inc., Dublin, CA) using version 4.0 software. For each subject, only one eye was randomly included. The raw data of RNFL thickness at 256 points were plotted in double hump pattern graphs with percentile distribution color bands as seen in STRATUSOCT. The percentile distribution confidence bands were bordered at 1%, 5%, and 95%. The corrected database was applied to seven preperimetric normal-tension glaucoma patients with RNFL defects in red free photograph but with normal OCT results by conventional normative database.

Main outcomes /results: The mean age of normals in the new database was 59.2 ± 9.6 years. Three of seven preperimetric NTG who had normal OCT finding by conventional database showed significant defects by the new normative database, and the defect accorded with the location of RNFL defect in red free photograph.

Conclusions: This preliminary result shows the possibility that by customizing normative database according to the race difference, the false negative detection rate of OCT for early glaucoma may be lowered.

References:

1. Zangwill LM, Williams J, Berry CC, *et al.* A comparison of optical coherence tomography and retinal nerve fiber layer photography for detection of nerve fiber layer damage in glaucoma. Ophthalmology 2000;107:1309–1315. **2.** Soliman MAE, Van Den Berg TJTP, Ismaeil AA *et al.* Retinal nerve fiber layer analysis: relationship between optical coherence tomography and red-free photography. Am J Ophthalmol 2002;133:187–195. **3.** Teesalu P, Tuulonen A, Airaksinen PJ. Optical coherence tomography and localized defects of the retinal nerve fiber layer. Acta Ophthalmol Scand 2000;78:49–52. **4.** Woo SJ, Park KH, Kim DM; Comparison of localised nerve fibre layer defects in normal tension glaucoma and primary open angle glaucoma. Br J Ophthalmol 2003;87:695-8. **5.** Pieroth L, Schuman JS, Hertzmark E, *et al.* Evaluation of focal defects of the nerve fiber layer using optical coherence tomography. Ophthalmology 1999;106:570–79. **6.** Garcia-Sanchez C, Bowd C, Blumenthal EZ, *et al.* Using optical imaging summary data to detect glaucoma. Ophthalmology 2001;108: 1812-18.

P143 CORRELATION BETWEEN STRATUS OCT AND HRT II IN EARLY GLAUCOMA

J.M. Kim[1], K.H. Park[2], S.H. Kang[2], T.W. Kim[3], D.M. Kim[2]
[1]Kangbuk Samsung Hospital, Seoul, South-Korea, [2]Seoul National University, Seoul, South-Korea, [3]Bundang SNU Hospital, Keonggi-do, South-Korea

Purpose: To evaluate the ability of Stratus OCT and HRT II with Moorfields'analysis to detect localized RNFL defects and the accordance of the results of Stratus OCT and HRT II in glaucoma patients.

Design: Non-randomized, cross-sectional study.

Participants: A total of 60 patients (119 eyes) who had localized RNFL defects of either eye in red-free fundus photographs were analyzed.

Methods: A total of 60 patients (119 eyes) who had localized RNFL defects of either eye in red-free fundus photographs performed Stratus OCT and HRT II. In the results of Stratus OCT and HRT II with Moorfields' analysis, the normal distribution percentiles less than 5% were considered as a significant RNFL defect. For each disc, superotemporal and inferotemporal portions were evaluated. The diagnostic abilities of Stratus OCT and HRT II to detect localized RNFL defects were calculated. The results of HRT II were compared with that of Stratus OCT.

Main outcomes /results: The overall sensitivity, specificity, positive predictive value and negative predictive value to detect localized RNFL defects were 68.2%, 89.1%, 84.3% and 76.5% in Stratus OCT and 67.3%, 65.9%, 62.2% and 69.6%, respectively. A comparison with Stratus OCT, the results of HRT II were in accord with 67.2% in superotemporal portion and 68.9% in inferotemporal portion. The accordance of detection of RNFL defects between 2 instruments in inferotemoral portion is higher (79.2%) than others.

Conclusions: Stratus OCT with normative database is a useful aid to detect of localized RNFL defect in early glaucoma. If observation of topographic change of optic disc with HRT II is added, it will be better.

References:

1. Bowd C, Weinreb RN, Williams JM, Zangwill LM. The retinal nerve fiber layer thickness in ocular hypertensive, normal, and glaucomatous eyes with optical coherence tomography. Arch Ophthalmol 2000;118:22–26. **2.** Greaney MJ, Hoffman DC, Garway-Heath DF, Nakla M, *et al.* Comparison of optic nerve imaging methods to distinguish normal eyes from those with glau-

coma. Invest Ophthalmol Vis Sci 2002;43:140–45. **3.** Mistlberger A, Liebmann JM, Greenfield DS, *et al.* Heidelberg retina tomography and optical coherence tomography in normal, ocular hypertensive, and glaucomatous eyes. Ophthalmology 1999;106:2027-32. **4.** Ford BA, Artes PH, McCormick TA, *et al.* Comparison of data analysis tools for detection of glaucoma with the Heidelberg retina tomography. Ophthalmology 2003;110:1145-50. **5.** Pieroth L, Schuman JS, Hertzmark E, *et al.* Evaluation of focal defects of the nerve fiber layer using optical coherence tomography. Ophthalmology 1999;106:570–79. **6.** Greenfield DS. Optic nerve and retinal nerve fiber layer analyzers in glaucoma. Curr Opin Ophthalmol 2002, 13:68–76.

P144 REPRODUCIBILITY OF STANDARD AND FAST ALGORITHMS OF OCT III NERVE FIBRE LAYER THICKNESS AT 3.4 MM.

A. Anton[1], R. Cuadrado[1], A. Flores[1], F. Blazquez[1], J. Moreno[2], V. Polo[3], B. Martín[1]
[1]IOBA, Valladolid, Spain, [2]Clínica Univ. de Navarra, Navarra, Spain, [3]Hosp. Miguel Servet, Zaragoza, Spain

Introduction: OCT[1-3,4] is capable of producing objective measures of the retinal nerve fiber layer (RNFL) and is able to discriminate between normal and glaucoma eyes[5]. OCT Stratus offers two different image algorithms (fast and standard) and their reproducibility and classification results have not been compared yet..
Purpose: To assess and compare the reproducibility of OCT nerve fibre layer (RNFL) parameters of standard and fast RNFL Thickness at 3.4 mm. Method: Cross sectional study. Thirty one eyes (9 normal, 11 ocular hypertensive [OHT], 2 suspects and 9 glaucomas) of 16 subjects were included in this study. All received a complete ophthalmic examination including colour disk photographs and reliable standard visual field (Humphrey-SITA 24-2). OHT has IOP over 21 mmHg, normal disks and normal fields. Glaucomas were only included if IOP was over 21 mmHg, and had glaucomatous changes in both disks and fields. Nerve Fibre Layer (RNFL) was assessed with OCT III using two different algorithms of the protocol RNFL Thickness 3.4: Fast and Standard. To evaluate OCT reproducibility, coefficient of variation, among three different images of each algorithm, was calculated for the following parameters: average thickness, superior thickness and inferior thickness. OCT normative database offers automatic classification in three categories: with in normal limits (95%), borderline (96 to 99%) and outside normal limits (under 99% limits). The classification results obtained for the three different images of each eye were compared.
Results: Mean coefficient of variation for average thickness, superior thickness and inferior thickness is shown in table 1. In 10 eyes (15%) there was a change in the classification of at least one of the three parameters. Table 2 shows the number of eyes with a classification change for each parameter and algorithm. Average RNFL classification changed more frequently, among the 3 images of the same eye, with Fast Algorithm (9.3%) than with Standard algorithm (3.1%).
Conclusion: OCT RNFL measurements show good reproducibility with both algorithms, nevertheless some classification changes do occurred among different images of the same eye.
References:
1. Schuman, J.S., *et al.*, Optical coherence tomography: a new tool for glaucoma diagnosis. Curr Opin Ophthalmol, 1995. 6(2): p. 89-95. **2.** Mistlberger, A., *et al.*, Heidelberg retina tomography and optical coherence tomography in normal, ocular-hypertensive, and glaucomatous eyes. Ophthalmology, 1999. 106(10): p. 2027-32. **3.** Schuman, J.S., *et al.*, Reproducibility of nerve fiber layer thickness measurements using optical coherence tomography. Ophthalmology, 1996. 103(11): p. 1889-98. **4.** Nouri-Mahdavi, K., *et al.*, Identifying early glaucoma with optical coherence tomography. Am J Ophthalmol, 2004. 137(2): p. 228-35. **5.** Schuman, J.S., *et al.*, Comparison of optic nerve head measurements obtained by optical coherence tomography and confocal scanning laser ophthalmoscopy. Am J Ophthalmol, 2003. 135(4): p. 504-12.

P145 STRUCTURAL-FUNCTIONAL REGRESSION ANALYSIS IN GLAUCOMA

C.K.S. Leung[1], K.T. Tang[1], K.L. Chong[2], W.M. Chan[2], J. Woo[1], K.K. Tse[1]
[1]Caritas Medical Centre, Sham Shui Po, Hongkong' [2]The Chinese University of HK, Shatin, Hongkong

Purpose: To evaluate the structural-functional relationship between the retinal nerve fiber layer thickness (RNFLT) measured by Optical Coherence Tomography and the visual field(VF) sensitivity.
Design: Cross sectional study.
Participants: A total of 89 subjects with 27 normal, 21 glaucoma-suspect and 41 glaucoma eyes were included.
Methods: RNFLT was measured by Stratus OCT and VF was examined with Humphrey VF analyzer. The relationships between RNFLT and VF sensitivity, expressed in terms of MD(dB), the unlogged 1/L, and the AGIS and the CIGTS VF scores, were evaluated with linear and nonlinear regression (the 2nd order polynomial, the 3rd order polynomial, the 1st order inverse and the logarithmic) models (only glaucoma patients were analyzed in evaluating the relationships between RNFLT and VF scores). R2 was calculated and the regression models were compared with Alkaike's Information Criteria and the F test.
Results: Plotting MD against RNFLT, the 2nd order polynomial demonstrated the best fit in the regression analysis (Figure1A) whereas linear regression attained the best associations when the perimetry scale was expressed in 1/L (Figure1B). The regression profiles between the AGIS/CIGTS VF scores and the RNFLT were best fit in the 1st order inverse models (Figure 2). To quantify the rate of change of VF scores in relation to different stages of glaucoma, differentiation of the regression equations were performed. At RNFLT of 81.42, 65.34 and 49.26µm, corresponding to mean (±SD) RNFLT in the glaucoma group, the AGIS and the CISTS VF scores increased at the rate of 0.17, 0.27 0.47 and 0.18, 0.28 and 0.49 respectively.
Conclusions: The description of the structural-functional relationships in glaucoma is dependent on the choice of expressions of VF sensitivity. The curvilinear regression profiles found between RNFLT and the AGIS/CISTS VF scores / MD support those longitudinal studies in demonstrating the increased severity of baseline MD or VF scores have higher risks of functional deterioration. For the same degree of structural damage (reduction in RNFLT), the increase in VF scores is more dramatic in the advanced stage of the disease compared to that in the early stage. Therefore, the current AGIS and CIGTS scoring systems are considered to be less sensitive to detect progression in early glaucoma since the steps for progression is defined independent of the stage of the disease. Regression analysis of the structural-functional profile could provide important information in the assessment of the trend and pattern of glaucoma progression.
References:
1. Reus NJ, Lemij HG.The relationship between standard automated perimetry and GDx VCC measurements. Invest Ophthalmol Vis Sci.2004;45(3):840-5. **2.** Schlottmann PG, De Cilla S, Greenfield DS, *et al.*Relationship between visual field sensitivity and retinal nerve fiber layer thickness as measured by scanning laser polarimetry. Invest Ophthalmol Vis Sci.2004;45:1823-9. **3.** Leske MC, Heijl A, Hussein M, *et al.*Factors for glaucoma progression and the effect of treatment: the early manifest glaucoma trial.Arch Ophthalmol.2003;121:48-56.

P146 ASSESSMENT OF RELIABILITY OF NORMATIVE DATABASE FOR RETINAL NERVE FIBER LAYER (RNFL) ANALYSIS BY OCT IN INDIAN EYES

A. Narayanaswamy, R. George, V. Lingam, C. Chitra
Sankara Nethralaya, Chennai, India

Introduction: Racial differences in optic nerve morphology and RNFL is well documented[1-2]. RNFL assessment is important to diagnose and monitor progression of glaucoma[3-5]. Normative database incorporated in any imaging tool like the OCT is likely to be different from a sample Indian population. This difference may influence the results of RNFL analysis.
Aim: To assess reliability of normative database for retinal nerve fiber layer (RNFL) analysis by OCT in Indian eyes
Methods: One hundred normal subjects (M:F: 54:46), mean age 44.26 ± 10.91 years (22- 71) underwent a comprehensive eye exam, optic disc photography, visual field analysis (HVF 24-2,Sita-standard) and RNFL assessment by Stratus OCT.One eye (OD) of each subject was selected for analysis. All eleven RNFL parameters were evaluated for abnormality based on the statistical grading provided by the software.
Results: Two ratio based parameters Smax/Navg and Smax/Imax was noted to be flagged.Smax/Navg was noted to be abnormal in 7% of eyes (95% CI 0.01-11.9%).Smax/Imax was abnormal in 5% (95% CI 0.07 - 9.32).All other parameters showed abnormalities in < 5% of the normal population.
Conclusion: The normative database in the stratus OCT appears to be applicable to Indian eyes.
References:
1. Quigley HA,Brown AE,Morrison JD,Drance SM.The size and shape of optic disc in normal human eyes. Arch Ophthalmol 1990; 108:51-57. **2.** Poinoosawmy D,Fontana L,Wu JX,Fitzke FW,Hitchings RA.Variation of nerve fiber layer thickness measurements with age and ethnicity by scanning laser polarimetry.Br J Ophthalmol 1997;81:350-54 **3.** Sommer A,Miller NR,Pollack J,Maumenee AE,George T.The nerve fiber layer in the diagnosis of glaucoma.Arch Ophthalmol 1977;95:2149-56. **4.** Quigley HA,Miller NR,GeorgeT.Clinical evaluation of nerve fiber layer as an indicator of glaucomatous optic nerve damage.Arch Ophthalmol 1980;98:1504-10 **5.** Repka M,Quigley HA.The effect of age on normal human optic nerve fiber number and diameter. Ophthalmol 1989;96:26-32.

P147 THREE-DIMENSIONAL ULTRAHIGH RESOLUTION OPTICAL COHERENCE TOMOGRAPHY

B. Kiss[1], C. Hirn[2], S. Sacu[2], C. Vass[2], B. Povazay[3], B. Hermann[3], H. Sattmann[3], U. Schmidt-Erfurth[2], W. Drexler[3]
[1]General Hospital of Vienna, Vienna, Austria, [2]Medical University of Vienna, Vienna, Austria, [3]Center f. Biomed. Engineering, Vienna, Austria

Introduction: Detection of nerve fiber layer and retinal ganglion cell loss for early diagnosis of preperimetric glaucoma is still a matter of controversy. The novel version of non-invasive optical biomedical imaging technology, ultrahigh resolution optical coherence tomography (UHR OCT), can perform cross-sectional, three-dimensional topographic and tomographic imaging of the retina and enables *in vivo* visualization and quantification of intraretinal morphology, available only with conventional histopathology so far.
Aim of study: To demonstrate the clinical feasibility of three-dimensional UHR OCT for glaucoma diagnosis and preliminary results of the potential of this technique for *in vivo* imaging of the retinal ganglion cell layer and nerve fiber layer thickness.
Methods: Healthy volunteers and patients with typical glaucomatous scotomas, *e.g.* hemifield, paracentral defects and end-stage glaucoma, were evaluated using a second generation ultrahigh resolution OCT system for retinal imaging employing a compact, commercially available ultrabroad bandwidth (160 nm) Titanium:shappire laser. Three dimensional retinal imaging can be performed with high axial resolution of 3µm and up to 25 B-scans/second, each tomogram consisting of 1024x1024 pixels, resulting in 25 Megavoxels/second. Visual field defects were assessed using automated computer perimetry (Humphrey 10-0) and retinal nerve fiber layer was documented using scanning laser polarimetry (GDx-VCC).
Results: UHR OCT enables three dimensional topographic and tomographic investigation of the optic disc as well as macular region. Preliminary *in vivo* identification and measurement of macular ganglion cell layer and circumpapillary nerve fiber layer in healthy subjects and in patients with typical glaucomatous scotomas indicate huge potential of this technique for glaucoma diagnosis.
Conclusions: Three-dimensional UHR OCT might provide a sensitive diagnostic device for monitoring therapeutic efficacy and tracking the progression of disease, since it is able to detect early stages of glaucoma by detecting changes in the retinal ganglion cell layer.
References:
1. Drexler W., Morgner U, Kärtner FX, Pitris C, Boppart SA, Li XD, Ippen EP, Fujimoto JG. *In vivo* ultrahigh resolution optical coherence tomography. Opt. Lett1999;24:1221-1223 **2.** Drexler W, Morgner U, Ghanta RK, Schuman JS, Kärtner FX, Ippen EP, Fujimoto JC. Ultrahigh resolution optical coherence tomography of the human retina. Nature Medicine 2001;4:502-507 **3.** Drexler W, Sattmann H, Hermann B, Ko TH, Stur M, Unterhuber A, Scholda C, Findl O, Wirtitsch M, Fujimoto JG, Fercher AF. Enhanced visualization of macular pathology using ultrahigh resolution optical coherence tomography. Arch Opthalmol 2003;121:695-706 **4.** Hee MR, Izatt JA, Swanson EA, Huang D, Schuman JS, Lin CP, Puliafito CA and Fujimoto JG. Optical coherence tomography of the human retina. Arch Opthalmol 1995;113:325-332

P148 AGREEMENT BETWEEN SCANNING LASER POLARIMETRY AND OPTICAL COHERENCE TOMOGRAPHY MEASUREMENTS OF THE RETINAL NERVE FIBER LAYER THICKNESS IN GLAUCOMATOUS PATIENTS

I.M. Tavares[1], V.N. Sakai[2], T.T. Takata[2], L.A.S. Melo, Jr[2], J.A. Prata, Jr[2]
[1]UCSD - Hamilton Glaucoma Center, La Jolla, CA, United States of America, [2]Fed University of Sao Paulo, Sao Paulo, Brazil

Introduction: Optical coherence tomography is an optical imaging technique that provides reproducible images of the retinal nerve fiber layer (RNFL). In scanning laser polarimetry, the retina in and around the optic nerve head is probed with polarized light to detect RNFL phase retardation, which is converted to RNFL thickness
Purpose: To compare the RNFL thickness obtained by scanning laser polarimetry with variable cornea compensator (GDx-VCC) and optical coherence tomography (Stratus OCT) in glaucomatous patients
Methods: Twenty-nine eyes of eighteen patients were included. The patients had glaucoma, best-corrected visual acuity of 20/60 or better, neither significant media opacity nor other significant ocular disease. Peripapillary RNFL thickness was obtained by GDx and OCT using circles with radius of 1.4 mm, 1.8 mm and 2.2 mm centered on the optic disc. The average RNFL thickness of each circle obtained by both devices was compared. A linear mixed model was used to adjust for correlations between measurements of both eyes of the same individual
Results: The Lin's concordance correlation coefficients between OCT and GDx measurements at 1.4-mm, 1.8-mm and 2.2-mm radii circles were 0.07 (P=0.03), 0.06 (P=0.13) and 0.11 (P=0.09), respectively. The mean differences between OCT and GDx measurements at 1.4-mm, 1.8-mm and 2.2-mm radii circles were 42.35 µm (95% Confidence Interval [CI]: 37.46 to 47.25 µm; P<0.001), 31.00 µm (95% CI: 26.37 to 35.63 µm; P<0.001) and 24.50 µm (95%CI: 19.99 to 29.00 µm; P<0.001), respectively. The mean ratios of OCT to GDX measurements at 1.4-mm, 1.8-mm and 2.2-mm radii circles were 2.1 (95% CI: 1.92 to 2.20; P<0.001), 1.9 (95% CI: 1.7 to 2.1; P<0.001) and 1.8 (95% CI: 1.6 to 1.9; P<0.001), respectively
Conclusions: There is poor agreement between OCT and GDx RNFL thickness measurements in glaucomatous patients. The RNFL thickness obtained using Stratus OCT is about two-fold thicker than GDx-VCC measurements
References:
1. Weinreb RN, Bowd C, Zangwill LM. Glaucoma detection using scanning laser polarimetry with variable corneal polarization compensation. Arch Ophthalmol. 2003;121:218–224 **2.** Bowd C, Weinreb RN, Williams JM, Zangwill LM. The retinal nerve fiber layer thickness in ocular

hypertensive, normal, and glaucomatous eyes with optical coherence tomography. Arch Ophthalmol 2000;118:22–26 **3.** Zangwill LM, Williams J, Berry CC, *et al.* A comparison of optical coherence tomography and retinal nerve fiber layer photography for detection of nerve fiber layer damage in glaucoma. Ophthalmology 2000;107:1309 –1315 **4.** Bowd C, Zangwill LM, Berry CC, *et al.* Detecting early glaucoma by assessment of retinal nerve fiber layer thickness and visual function. Invest Ophthalmol Vis Sci 2001;42:1993–2003 **5.** Medeiros FA, Zangwill LM, Bowd C, Vessani RM, Susanna R Jr, Weinreb RN. Evaluation of retinal nerve fiber layer, optic disc nerve head, and macular thickness measurements for glaucoma detection using optical coherence tomography. Am J Ophthalmol 2005;139:44-55

P149 GLAUCOMA DIAGNOSIS USING STRATUS OPTICAL COHERENCE TOMOGRAPHY IN TAIWAN CHINESE SUBJECTS

H.Y. Chen[1], M.L. Huang[2], P.T. Hung[1]
[1]China Medical University Hospital, Taichung, Taiwan, [2]Chin-Yi Institute of Technolog, Taichung, Taiwan

Introduction: Changes in the structural appearance of the optic nerve head (ONH) have been reported to precede the development of visual field loss in glaucoma[1] Detection of ONH and retinal nerve fiber layer (RNFL) damage is crucial for early glaucoma diagnosis[2,3]. Recent attention has also been directed to the role of macular thickness measurements for glaucoma diagnosis[4,5].
Aim of the study: We differentiated between normal and glaucomatous eyes in a Taiwan Chinese population based on Stratus optical coherence tomography (OCT) data by comparing their area under the receiver operative characteristic curve (AUC).
Methods: Eighty-two glaucoma patients (mean deviation, -5.14 ± 5.61dB) and 88 normal individuals were included. (Table 1) Informed consent was obtained from all subjects. The research follows the Tenets of the Declaration of Helsinki. All subjects underwent ONH, RNFL thickness, and macular thickness scans with Stratus OCT. AUCs and sensitivities at fixed specificities were calculated for each parameter. Twenty three OCT parameters were included in linear discriminant analysis (LDA) to determine the best combination of parameters for increasing the discriminating power.
Results: Table 2 shows the results of 23 input parameters from Stratus OCT in both groups. Table 3 shows the AUC and sensitivities at fixed specificities calculated for each parameter. The RNFL thickness parameter had a significantly larger AUC (average thickness, AUC = 0.835) than the ONH parameter with largest AUC (vertical integrated rim area, AUC = 0.747) (P = .02). The RNFL parameter average thickness had a significantly larger AUC than the macular thickness parameter with largest AUC (inferior outer macular thickness, AUC = 0.734) (P = .009). No statistically significant difference was found between AUC for the ONH parameter with largest AUC and the macular thickness parameter with largest AUC. When using LDA with stepwise selection method, the largest AUC was 0.913 with 10 input parameters (nasal quadrant thickness, inferior quadrant thickness, vertical integrated rim area, horizontal integrated rim width, cup area, cup/disc horizontal ration, fovea retinal thickness, temporal inner macula, temporal outer macula, superior outer macula). (Figure 1)
Conclusion: The discriminant power increases when LDA with stepwise selection method was used.
References:
1. Medeiros FA, Zangwill LM, Bowd C, *et al.* Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and stratus OCT optical coherence tomograph for the detection of glaucoma. Arch Ophthalmol. 2004;122:827-37. **2.** Wollstein G, Ishikawa H, Wang J, *et al.* Comparison of three optical coherence tomography scanning areas for detection of glaucomatous damage. Am J Ophthalmol 2005;139: 39-43. **3.** Medeiros FA, Zangwill LM, Bowd C *et al.* Evaluation of retinal nerve fiber layer, optic nerve head, and macular thickness measurements for glaucoma detection using optical coherence tomography. Am J Ophthalmol. 2005;139:44-55. **4.** Guedes V, Schuman JS, Hertzmark E, *et al.* Optical coherence tomography measurement of macular and nerve fiber layer thickness in normal and glaucomatous human eyes. Ophthalmology. 2003;110:177-89. **5.** Lederer DE, Schuman JS, Hertzmark E, *et al.* Analysis of macular volume in normal and glaucomatous eyes using optical coherence tomography. Am J Ophthalmol. 2003;135:838-43.

Bloodflow

P150 ROLE OF OCULAR BLOOD FLOW USING COLOR DOPPLER IMAGING IN UNTREATED PATIENTS OF GLAUCOMA

S. Gupta, S. Goyal, S. Sood
G.M.C.H. Chandigarh, India

Introduction: Recently considerable attention has been given to the possible contribution of vascular mechanisms in the pathogenesis of optic neuropathy in glaucoma patients. The abnormalities of blood flow of optic nerve head has been reported in normal tension glaucoma (NTG) patients using color doppler imaging (CDI). Color doppler imaging is a non-invasive ultrasonic technique that allows a combination of grey scale imaging of tissue structure with superimposed color coded vascular flow.
Aim: The aim of our study was to evaluate blood flow in orbitall blood vessels using CDI in patients having NTG, POAG and CACG (Chronic Angle closure glaucoma).
Methods: Forty patients of POAG, 40 patients of NTG, 40 patients of PACG and 25 normal controls were included in the study. Color doppler imaging was performed by an experienced radiologist to measure resistive index (RI) in Central Retinal Artery (CRA), Short Posterior Ciliary Artery(SPCA) and Ophthalmic Artery (OA) in patients of POAG, NTG, PACG and normal controls.
Results: Mean resistive index (RI) in Ophthalmic artery (OA), CRA & SPCA was 0.73,0.72, and 0.79.respectively in NTG patients. Mean RI, in OA, CRA & SPCA was 0.65, 0.68 and 0.62 in POAG patients. Mean RI in OA, CRA & SPCA was in CACG patients and mean RI in OA, CRA, SPCA was 0.58, 0.55 and 0.56 in normal controls. There was a statistically significant 0.52,0.55 and 0.53 (P<0.05, 0.01 and 0.001) increase in RI of OA, CRA & SPCA in NTG group as compared to normal controls. But the RI increase in patients of POAG and CACG was not statistically significant (P <0.05) as compared to normal controls.
Conclusions: There was an increased resistance to blood flow in CRA, SPCA and OA in patients of NTG. Increased resistance to orbital blood flow will lead to ischemia of optic nerve head.
References:
1. Erikson SJ, Hendirx LE, Massaro BM, Harrsi GJ, *et al.* Colour Doppler flow imaging of normal and abnormal orbit. Radiology 1989; 173:511-516. **2.** Aburn NS, Sergott RC. Orbit Colour Doppler imaging Eye 1993; 7: 639-647. **3.** Berges O. Colour Doppler flow imaging of the orbital veins. Acta Ophthalmol Suppl. 192; 204:55-58. **4.** Hayreh SS, Walker WM. Flourescent fundus photography in glaucoma. Br. J. Ophthalmol 1967; 63:982-989. **5.** Hamard P, Hamard H, Dufaux J, Quesnot S. Optic nerve head blood flow using a laser Doppler velocimeter and haemorheology in primary open angle glaucoma and normal pressure glaucoma. Br. J. Ophthalmol 1994;78: 449- 453.

P151 RELATONSHIP BETWEEN GLAUCOMATOUS VISUAL FIELD PROGRESSION AND CHANGES IN OPTIC NERVE HEAD TOPOGRAPHY AND BLOOD FLOW AT THE TIME OF INITIAL IOP REDUCTION: A PROSPECTIVE PILOT STUDY

M. Lesk, D. Papamatheakis, D. Descovich, A. Hafez
Maisonneuve-Rosemont Hospital, Montréal, Canada

Introduction: Our recent data[1] suggests that, compared to those with thicker corneas, glaucoma and ocular hypertensive patients with thin corneas had larger reductions in optic nerve head (ONH) cup depth and smaller improvements in neuroretinal rim blood flow when undergoing a sustained IOP reduction. Now we asked whether these ONH changes correlated with long term visual field stability.
Methods: 26 glaucoma and pre-perimetric glaucoma patients had Heidelberg retina tomography and scanning laser Doppler flowmetry (SLDF software v3.3) of the ONH before and 2-6 months following sustained therapeutically indicated IOP reduction. Peripheral vasospasticity was measured with finger Doppler during cold water immersion. Ultrasound pachymetry was performed. Visual field stability was monitored over the following 4.2± 1.0 years using modified Hodapp-Anderson-Parrish criteria[2].
Results: Eight patients progressed, 16 were stable, two were indeterminate (these excluded from analysis). At initial IOP reduction, progressing patients had 89 ± 144 µm mean shallowing of cup depth *vs.* 1 ± 50 µm in the stable group (p=0.029), and were more vasospastic (minimum finger flow 4.1 ± 2.3 tpu *vs.* 10.3 ± 8.2 tpu, p=0.017). Progressing patients had insignificantly thinner corneas (546 ± 50µm *vs.* 569 ± 59µm, p=0.4) and had insignificantly smaller initial increases in neuroretinal rim blood flow than stable patients (32 ± 96 au *vs.* 70 ± 119 au, p=0.44). Both progressing and stable groups had the same initial IOP reduction and the progressing group had slightly lower IOPs during follow-up.
Conclusion: Greater movement of the base of the cup, interpreted as a sign of a more compliant lamina cribrosa, appears to be linked to an increased risk of progressive glaucoma. Vasospasticity also appears to be linked to an increased risk of progression in this pilot series.
References:
1. Lesk MR, Hafez AS, Descovich D. Relationship Between Central Corneal Thickness (CCT) And Changes Of Optic Nerve Head (ONH) Topography And Blood Following IOP Change In Open Angle Glaucoma (OAG) And Ocular Hypertension (OHT). Paper presented at: ARVO Annual Meeting, April 28, 2004; Fort Lauderdale. **2.** Hodapp E, Parrish RK II, Anderson DR. Clinical Decisions In Glaucoma. St. Louis, MO: Mosby Year Book;1993:52-61.

P152 OCULAR BLOOD FLOW IN PRIMARY OPEN ANGLE GLAUCOMA EXFOLIATION SYNDROME AND EXFOLIATION GLAUCOMA

I. Durukan, C. Basaran, M. Irkec, M. Orhan
Hacettepe University, Ankara, Turkey

Introduction: Previous studies indicate differences in ocular blood flow in patients with primary open angle glaucoma (POAG), exfoliation syndrome (ES), and exfoliation glaucoma (EG) by using color doppler imaging (CDI).
Objective: To evaluate ocular blood flow velocities in Turkish patients with POAG, ES, and EG.
Methods: CDI was performed with a 7.5-MHz probe in patients with POAG (n=20), ES (n = 20), EG (n=20) and healthy subjects (n =20).
Results: Compared with controls, patients with POAG had significantly decreased mean peak systolic velocity (Pv) of the central retinal artery (13.71cm/s;p<0.05), TAV of the short posterior temporal (5.05cm/s;p<0.05) and nasal (3.21cm/s;p<0.05) ciliary arteries whereas mean RI of the central retinal artery (0.71; p<0.05), short posterior temporal (0.71;p<0.05) and nasal (0.66;p<0.05) ciliary arteries were found to be increased. Compared with controls, patients with EG had significantly decreased mean Pv of the central retinal artery (14.65cm/s;p<0.05), TAV of short posterior temporal (4.2cm/s;p<0.05) and nasal (2.74cm/s;p<0.05) ciliary arteries whereas mean RI of all vessels showed significant increase (p<0.05). Compared with controls, patients with ES showed significant decrease in the mean Pv of the central retinal artery (14.52cm/s;p<0.05) TAV of the short posterior temporal ciliary artery (3.9cm/s;p<0.05) whereas mean RI of all vessels showed significant increase (p<0.05). In comparison with EG patients, POAG patients showed significant increase in the TAV of short posterior temporal ciliary artery (5.05cm/s;p<0.05) whereas the mean RI of central retinal artery (0.719;p<0.05) and short posterior temporal ciliary artery (0.71;p<0.05) significantly decreased. Compared with the patients with ES, patients with POAG showed significant increase in the TAV of short posterior temporal ciliary artery (5.05cm/s;p<0.05). The differences in the mean RI was significantly increased in ophthalmic artery. Compared with the patients with ES, patients with the EG showed significant decrease in the Pv of the ophthalmic artery (44.69cm/s;p<0.05) whereas mean RI of the short posterior temporal ciliary artery (0.75;p<0.05) was found to be increased.
Conclusion: These findings suggest that ocular blood flow velocities in the retrobulbar vessels were altered in POAG, ES, EG though significance not known yet.
References:
1. Bull Z, O'Brien C, *et al.* CDI in untreated high and normal pressure open angle glaucoma. Invest Ophthalmol 1997;38:690-5. **2.** Kaiser HJ, Schoetzau A, *et al.* Blood flow velocities of extraocular vessels in patients with high tension and normal tension primary open angle glaucoma. Am J Ophthalmol 1997;123:320-7. **3.** Yüksel N, Karabaş L, *et al.* Ocular hemodynamics in pseudoexfoliation syndrome and pseudoexfoliation glaucoma. Ophthalmology 2001;108: 1043-9. **4.** Rankin SJ, Walman BE, *et al.* CDI and spectral analysis of the optic nerve vasculature in glaucoma. Am J Ophthalmol 1995;119:685-93. **5.** Sergott RC, Aburn NS, *et al.* CDI: Methodology and preliminary results in glaucoma. Surv Ophthalmol 1994;38:S65-71.

P153 COMPARISON OF OCULAR BLOOD FLOW IN NEWLY DIAGNOSED PATIENTS WITH GLAUCOMA, OCULAR HYPERTENSION AND NORMALS

G. Alagöz[1], K. Gürel[1], A. Bayer[2], D. Serin[1], S. Çelebi[1], H. Güngel[1]
[1]Abant Izzet Baysal Uni.I.B.Medical Fac., Bolu, Turkey, [2]Gülhane Military Med. Academy, Ankara, Turkey

Introduction: Altered blood supply to the optic nerve head seems to be important in the development and progression of several forms of glaucoma.
Purpose: To evaluate the differences in retrobulbar blood circulation among patients with newly diagnosed primary open angle glaucoma (POAG), ocular hypertension (OHT) and normal subjects.
***Design*:** The study was designed as a non- randomized clinical trial.
***Participants*:** All participants were classified into three groups; POAG (n=79), OHT (n=34) and control (n=74). Patients in POAG and OHT groups were all newly diagnosed and free of ocular medication.
***Methods*:** Physician I made the diagnosis. The sonographer performed color Doppler imaging (CDI) measurements of retrobulbar vessels.
***Main outcome measures*:** The intraocular pressures were measured with Goldmann applanation tonometer.
Flow velocities in the central retinal artery (CRA), central retinal vein (CRV), posterior ciliary artery (PCA), and ophthalmic artery (OA) were determined. From each vessel, a peak systolic velocity (PSV) and end-diastolic velocity (EDV) were recorded, and a resistance index (RI) was calculated.
***Results*:** The mean IOP of POAG and OHT patients were similar and significantly higher than control group.
All vascular parameters measured in OHT and control groups were statistically similar. The PSV and EDV were lower and RI was higher in glaucoma than OHT and control groups in all vessels. When we compared glaucoma and OHT groups, we found that differences in EDV of PCA and CRV, PSV of CRV, and RI of PCA and OA were significant. POAG and control group showed significant difference only in EDV and RI of all arteries and PSV and EDV of CRV.
***Conclusion*:** The ocular blood flow values of OHT patients are nearer to those of normal subjects than glaucoma patients[1]. Therefore, it can be speculated that patients with lower ocular blood flow velocities have higher rates of progression of glaucomatous damage[2]. However, it is still

controversial whether glaucoma is due to decreased ocular blood flow or decreased blood flow is due to glaucoma. Altered blood supply to the optic nerve head seems to be important in the development and progression of several forms of glaucoma[3,4,5].

***References*:**

1. Hafez AS, Bizzarro RL, Rivard M, Lesk MR. Changes in optic nerve head blood flow after therapeutic intraocular pressure reduction in glaucoma patients and ocular hypertensives. Ophthalmology 2003; 110:201-210 ,26. **2.** Satilmis M, Orgul S, Doubler B, Flammer J.Rate of progression of glaucoma correlates with retrobulbar circulation and intraocular pressure. Am J Ophthalmol. 2003 May;135(5):664-9.) **3.** Costa VP, Sergott RC, Smith M, *et al.* Color Doppler imaging in glaucoma patients with asymmetric optic cups. J Glaucoma 1994;3(Suppl):S91–7. **4.** Nicolela MT, Drance SM, Rankin SJ, *et al.* Color Doppler imaging in patients with asymmetric glaucoma and unilateral visual field loss. Am J Ophthalmol 1996;121:502–10. **5.** Akarsu C, Bilgili MY.Color Doppler imaging in ocular hypertension and open angle glaucoma. Graefes Arch Clin Exp Ophthalmol. 2004 Feb;242(2):125-9.

P154 DECREASED BLOOD FLOW AT NEURORETINAL RIM OF OPTIC NERVE HEAD CORRESPONDS WITH VISUAL FIELD DEFICIT IN EYES WITH NORMAL TENSION GLAUCOMA

I Kimura
Keio University School of Medicine, Tokyo, Japan

***Purpose*:** To determine the relationship between the blood flow parameters of the blood vessels at the rim of the optic disc and the glaucomatous visual field changes.
***Design*:** Observational cross-sectional study.
***Participants*:** Fifty nine patients with normal tension glaucoma (NTG) participated in the study. Patients were selected whose visual field defects were confined to either the superior or inferior hemifield.
***Methods*:** Tissue blood flow in the neuroretinal rim of the optic disc was determined with the Heidelberg retina flowmeter in eyes of the participants. Blood flow measurements were made in a 10 x 2.5 degree area of the superior and inferior margins of the optic disc.
***Main outcome measures*:** The mean blood flow (MBF; arbitrary units) was calculated by the automatic full-field perfusion image analyzer program, and the ratio of the MBF in the superior to the inferior neuroretinal rim areas (the S/I ratio) was calculated.
***Results*:** The mean S/I ratios of the MBF in the eyes with advanced superior visual field defect (1.45, n=41) was significantly higher than that in the eyes with advanced inferior visual field defect (0.78, n = 18; P <0.0001, Mann-Whitney U-test).
***Conclusions*:** The blood flow in the neuroretinal rim was found to correspond to the regional visual field defect in eyes with NTG.
***References*:**

1. Stamper RL, Lieberman MF, Drake MV. Optic Nerve Anatomy and Pathophysiology. *In:* Becker-Shaffer's Diagnosis and Therapy of the Glaucomas. 7th ed. St Louis, MO: Mosby, 1999;177-190. **2.** Gramer E, Tausch M. The risk profile of the glaucomatous patient. Curr Opin Ophthalmol 1995;6:78-88. **3.** Quigley HA, Addicks EM. Regional differences in the structure of the lamina cribrosa and their relation to glaucomatous optic nerve damage. Arch Ophthalmol 1981;99:137-143. **4.** Anderson DR. Optic Nerve Blood Flow. *In*: Drance SM, Anderson DR, editors. Optic nerve in glaucoma. Amsterdam/New York: Kugler publications, 1995:311-331.
5. Flammer J, Orgul S. Optic nerve blood-flow abnormalities in glaucoma. Prog Retin Eye Res 1998;17:267-289. **6.** Harris A, Chung HS, Ciulla TA, Kagemann L., Progress in measurement of ocular blood flow and relevance to our understanding of glaucoma and age-related macular degeneration. Prog Retin Eye Res 1999;18:669-687. **7.** Hayreh SS. The 1994 Von Sallman Lecture. The optic nerve head circulation in health and disease. Exp Eye Res. 1995;61:259-272. **8.** Spaeth GL.,Pathogenesis of visual loss in patients with glaucoma. Pathologic and sociologic considerations. Trans Am Acad Ophthalmol Otolaryngol 1971;75:296-317. **9.** Logan JF, Rankin SJ, Jackson AJ. Retinal blood flow measurements and neuroretinal rim damage in glaucoma. Br J Ophthalmol 2004;88:1049-1054. **10.** Harris A, Ishii Y, Chung HS, Jonescu-Cuypers CP, McCranor LJ, Kagemann L, Garzozi HJ. Blood flow per unit retinal nerve fibre tissue volume is lower in the human inferior retina. Br J Ophthalmol 2003; 87:184-188. **11.** Hart WM Jr, Becker B. The onset and evolution of glaucomatous visual field defects. Ophthalmology 1982;89:268-279. **12.** Yamazaki Y, Drance SM. The relationship between progression of visual field defects and retrobulbar circulation in patients with glaucoma. Am J Ophthalmol 1997;124: 287-295. **13.** Grunwald JE, Piltz J, Hariprasad SM, DuPont J. Optic nerve and choroidal circulation in glaucoma. Invest Ophthalmol Vis Sci. 1998;39:2329-2336.

Ultrasound

P155 EVALUATION OF THE ANTERIOR CHAMBER ANGLE IN ASIAN INDIAN EYES BY ULTRASOUND BIOMICROSCOPY AND GONIOSCOPY

S. Kaushik, R. Jain, S.S. Pandav, A. Gupta
Postgraduate Institute, Chandigarh, India

***Purpose*:** To compare the Ultrasound Biomicroscopic measurement of the anterior chamber angle in Asian Indian eyes with the angle width estimated by gonioscopy.
***Design*:** Observational Cross-sectional Study.
***Participants*:** One hundred and sixty three eyes of 163 patients were assessed by gonioscopy and Ultrasound Biomicroscopy (UBM)[1,2].
***Methods*:** Temporal quadrants of the angles were categorized by gonioscopy as Grade 0 to Grade 4 using Schaffer's[3] classification. The angles assessed by gonioscopy were quantified by UBM using the UBM Model 840, Paradigm Medical Industries Inc®. The angles were further segregated into 'narrow angles' (Schaffer's Grade 2 or less) and 'open angles' (Schaffer's Grade 3 and 4)[4].
***Main outcome measures*:** Angle opening distance at 250 µ (AOD 250) and 500 µ (AOD 500) from the scleral spur, and Trabecular meshwork-ciliary process distance (TCPD)[2]. UBM measurements were computed in each case and analyzed in relation to the gonioscopic angle evaluation.
***Results*:** 106 eyes had 'narrow angles' and 57 eyes had 'open angles' on gonioscopy. There was a significant difference among the UBM measurements of each angle grade estimated by gonioscopy ($p < 0.001$) (Table 1). The mean AOD 250, AOD 500 and TCPD in narrow angles was 58 ± 49 µ, 102 ± 84 µ, and 653 ± 124 respectively, while it was 176 ± 47 µ, 291 ± 62 µ and 883 ± 94 µ in eyes with open angles ($p < 0.001$). All three UBM parameters measured in narrow angles showed more variation than those measured in open
angles.
***Conclusions*:** The angle width estimated by gonioscopy correlated significantly with the angle dimensions measured by UBM. Gonioscopy, though subjective[5], is a reliable method for estimating iridocorneal angle width.
***References*:**

1. Pavlin CJ, Harasiewicz K, Sherar MD, Foster S. Clinical use of Ultrasound Biomicroscopy. Ophthalmol 1991; 98:287-95. **2.** Pavlin CJ, Harasiewicz K, Eng P, Foster FS. Ultrasound biomicroscopy of anterior segment in normal and glaucomatous eyes. Am J Ophthalmol 1992; 113:381-9. **3.** Shaffer RN. Gonioscopy, Ophthalmoscopy and Perimetry. Trans Am Acad Ophthalmol Otolaryngol 1960;64:112-6 **4.** Stamper RL, Lieberman MF, Drake MV. Clinical Interpretation of gonioscopic findings. *In*: Stamper RL, Lieberman MF, Drake MV, editors. Becker-Shaffer's Diagnosis and Therapy of the Glaucomas, 7th ed. St. Louis: Mosby, 1999:102-103. **5.** Congdon NG, Spaeth GL, Augsburger J, Klancnik J Jr, Patel K, Hunter DG. A proposed simple method for measurement of the anterior chamber angle: biometric gonioscopy. Ophthalmology 1999; 106:2161-7.

P156 AN ULTRASOUND BIOMICROSCOPIC STUDY OF ANTERIOR SEGMENT CHANGES AFTER LASER IRIDOTOMY IN EYES WITH SUBACUTE AND CHRONIC PRIMARY ANGLE CLOSURE GLAUCOMA

T. Dada[1], S. Mohan[1], R. Sihota[1], V. Gupta[1], R.M. Pandey[2]
[1]Dr Rajendra Prasad Centre for Ophthalmic, New Delhi, India, [2]Deparment of Biostatistics, New Delhi, India

***Purpose*:** To evaluate the changes in the anterior segment morphology induced by Laser iridotomy in eyes with subacute and chronic primary angle closure glaucoma (PACG).
***Design*:** Prospective comparative observational case series
***Participants*:** Sixty four eyes of 64 patients , 51 eyes with Subacute PACG and 13 eyes with Chronic PACG.
***Methods*:** The patients underwent detailed evaluation with slit lamp biomicroscopy, direct ophthalmoscopy, gonioscopy, applanation tonometry and visual field testing (Humphrey SITA Standard 30-2). Ultrasound biomicroscopy (UBM) was performed on the UBM Model 840 machine (Paradigm medical Industries, USA) with a 50-MHz transducer-probe. UBM images were analyzed using UBM Pro 2000 software[1,2].
The procedure was repeated 2 weeks after performing a laser iridotomy using Nd-YAG laser.
***Main outcome measures*:** 1.Trabecular-iris angle (TIA) – Superior & Inferior Angle. 2.Angle opening distance at 250µ (AOD 250µ). 3.Angle opening distance at 500µ (AOD 500µ). 4.Trabecular-ciliary process distance (TCPD). 5.Iris Thickness (IT). 6.Iris-ciliary process distance (ICPD). 7.Iris-lens contact distance (ILCD). 8.Iris lens angle (ILA). 9.Anterior chamber depth (ACD). 10.Scleral spur iris root distance (SSIR). 11.Angle recess area (ARA).
***Results*:** There was a significant widening of the superior and inferior anterior chamber angle after laser iridotomy in eyes with subacute as well as chronic PACG (Table 1 and 2). The central anterior chamber depth increased significantly after laser iridotomy in eyes with Subacute PACG but not in Chronic PACG.
***Conclusion*:** Peripheral laser iridotomy opens the narrow angle recess and deepens the central anterior chamber in eyes with subacute PACG[3]. In eyes with chronic PACG, it widens the anterior chamber angle without causing any significant changes in the central anterior chamber depth.
***References*:**

1. Pavlin CJ, Foster FS. Ultrasound biomicroscopy in glaucoma. Acta Ophthalmol Suppl 1992 ; 204 :7-9. **2.** Ishikawa H, Liebmann J, Ritch R. Quantitative assessment of anterior segment using ultrasound biomicroscopy. Curr Opin Ophthalmol 2000;11: 133-9. **3.** Gazzard G, Friedman DS, Devereux JG, Chew P, Seah SKL. A prospective ultrasound biomicroscopy evaluation of changes in anterior segnent morphology after laser iridotomy in Asian eyes. Ophthalmology 2003;110:630-8.

P157 AXIAL LENGTH AND ANTERIOR CHAMBER DEPTH IN SUBJECTS WITH PRIMARY ANGLE CLOSURE GLAUCOMA

C.M. Chan, T. Aung
Singapore National Eye Centre, Singapore, Singapore

***Introduction*:** There have been biomicroscopic studies investigating the axial length and anterior chamber depth in ocular disease.
***Purpose*:** The aim of this study was to investigate the axial length and anterior chamber depth in subjects with acute and chronic forms of primary angle closure glaucoma (PACG).
***Design*:** Prospective observational case series.
***Participants*:** One hundred and sixty-nine patients with PACG.
***Outcome*:** Axial length and anterior chamber depth.
***Methods*:** Primary angle-closure glaucoma was defined as the presence of glaucomatous optic neuropathy and compatible visual field loss associated with closed angles. Measurement of axial length and anterior chamber depth were performed on 169 PACG subjects using ultrasound pachymetry. Of these, 86 subjects had a past history of acute angle closure (AAC) and 83 had asymptomatic chronic PACG.
***Results*:** The mean axial length was 22.59 + 0.73 mm in patients with chronic PACG and 22.33 ± 0.85 mm in patients with acute disease ($p=0.04$), while the anterior chamber depth was 2.46 + 0.28 mm and 2.65 ± 0.58 mm ($p=0.47$) respectively.
***Conclusions*:** PACG subjects who presented acutely had shorter axial lengths than those with asymptomatic disease. However there was no difference in axial length between the two groups.
***References*:**

1. Mimiwati Z, Fathilah J. Ocular biometry in the subtypes of primary angle closure glaucoma in University Malaya Medical Centre. Med J Malaysia. 2001 Sep;56(3):341-9. **2.** Sihota R, Gupta V, Agarwal HC, Pandey RM, Deepak KK. Comparison of symptomatic and asymptomatic, chronic, primary angle-closure glaucoma, open-angle glaucoma, and controls. J Glaucoma. 2000 Jun;9(3): 208-13. **3.** George R, Paul PG, Baskaran M, Ve Ramesh S, Raju P, Arvind H, McCarty C, Vijaya L. Ocular biometry in occludable angles and angle closure glaucoma: a population based survey. Br J Ophthalmol. 2003 Apr;87(4):399-402.

P158 ULTRASOUND BIOMICROSCOPY STUDY OF IRIDOCILIARY ZONE IN SECONDARY GLAUCOMAS WITH ORGANIC BLOCK OF THE ANTERIOR CHAMBER ANGLE

V. Strenev
IRTC Eye Microsurgery, Ekaterinburg, Russian Federation

***Objective*:** Ultrasound biomicroscopy (UBM)[1,2] is a useful diagnostic tool in various forms of glaucoma. Nevertheless, there are no extensive UBM studies of patients with secondary glaucomas while it could be valuable for the choice of tactics. Aim of this paper is to estimate topographic status of uridociliary zone in secondary glaucomas with organic block of the anterior chamber angle by UBM.
***Design*:** A non-randomized instrumental and clinical study.
***Patients*:** Sixty patients (63 eyes) with neovascular (20 eyes), inflammatory (9 eyes), postoperative (19 eyes) and traumatic (15 eyes) glaucoma were enrolled. Control group was formed by 60 persons (60 eyes) with healthy eyes matching by age and sex.
***Methods*:** Standard UBM (Humphrey Ultrasound Biomicroscope Model 840, 62 MHz) was performed.
***Main outcome measures*:** Angle status, configuration of the posterior chamber acoustic cross-section and posterior chamber depth were estimated.
***Results*:** Various degrees of 'pull' angle block mechanism were found in 54 eyes (85.7%); in nine eyes (14.3%) the angle was filled with fibrovascular tissue and had rounded shape. Normal shape of the posterior chamber acoustic cross-section was seen in 51 cases (80.9%), 'opened' in nine (14.3%) (that is, absence of pupillary edge contact with the lens surface) and complete iridocorneal adhesion in three cases (4.8%). Shallow posterior chamber (not more than 0.4 mm) was found in 23 (38.3%) of normal and 21 (35.0%) of glaucomatous eyes; medium (0.41 to 0.8 mm) in 36 (60.0%) and 33 (55.0%); deep (not less than 0.8 mm) in 1 (1.7%) and 6 (10.0%), respectively. All the results did not depend on the etiology of secondary glaucoma. (chi-square test).
Conclusion: Most widespread forms of secondary glaucomas are characterized by similar

topographic changes of iridociliary zone: 'pull' mechanism of the angular block and tendency to deepened posterior chamber.

***References*:**

1. Pavlin C.J., Harasievich K., Sherar M.D., Foster F.S. Clinical use of ultrasound biomicroscopy// Ophthalmology.- 1991.- Mar 98:3.- 287-295. **2.** Pavlin C.J., Sherar M.D., Foster F.S. Subsurface ultrasound microscopic imaging of the intact eye// Ophthalmology.- 1990.- Feb 97:2.- P. 244-250.

P159 A PROSPECTIVE ULTRASOUND BIOMICROSCOPY EVALUATION OF CHANGES IN ANTERIOR SEGMENT MORPHOLOGY AFTER LASER IRIDOTOMY IN EUROPEAN EYES

N.D. Dang Burgener, M. Bagnoud, T. Shaarawy
Geneva University Hospitals, Geneva, Switzerland

Purpose: The aim of this study is to quantify anterior segment morphology changes by use of Ultrasound biomicroscopy (UBM) after Nd:YAG laser iridotomy in primary angle closure glaucoma (PACG) in European patients.

Patients and method: Ten eyes of ten patients presenting a PACG in 2004 and 2005 at our clinic were examined with UBM at presentation, and after a Nd:YAG laser peripheral iridotomy. Average age of patients was 65 years old. Five patients were females. Baseline measurements were made under darkness conditions. One eye was selected for inclusion in the study. Measurements of the angle were made before and after Nd:YAG laser iridotomy.

Results: All measurements were made in the four quadrants by the same examiner. The measured average angle is 4.66 degrees before and 8.83 degrees after the iridotomy, showing a significant increase in angle dimensions (p=0.006).

Conclusion: Angle dimensions can be significantly influenced by Nd YAG laser iridotomy in narrow angle European eyes, offering potential protection against acute angle closure. UBM examination is a viable and non-invasive tool for angle documentation and evaluation pre and post laser iridotomy.

References:

1. Gazzard G, Friedman DS, Devereux JG, Chew P, Seah SK. A prospective ultrasound biomicroscopy evaluation of changes in anterior segment morphology after laser iridotomy in Asian eyes.Ophthalmology. 2003 Mar;110(3):630-8. **2.** Garudadri CS, Chelerkar V, Nutheti R.An ultrasound biomicroscopic study of the anterior segment in Indian eyes with primary angle-closure glaucoma.J Glaucoma. 2002 Dec;11(6):502-7. **3.** Marraffa M, Marchini G, Pagliarusco A, Perfetti S, Toscano A, Brunelli C, Tosi R, Bonomi L.Ultrasound biomicroscopy and corneal endothelium in Nd:YAG-laser iridotomy.Ophthalmic Surg Lasers. 1995 Nov-Dec;26(6):519-23.

P160 THE WATER-DRINKING PROVOCATIVE TEST: COMPARISON BETWEEN PROGRESSIVE AND STABLE PRIMARY OPEN ANGLE GLAUCOMA PATIENTS AND RELATION TO DIURNAL TENSION CURVE

J.M. Rodriguez
Hospital Universitario de La Samaritana, Bogota, Colombia

***Purpose*:** To compare the intraocular pressure (IOP) rise obtained with a water drinking test (WDT) performed with half a liter and one liter water ingestion in stable and progressive Primary Open Angle Glaucoma (POAG) eyes and how it relates to the IOP fluctuation obtained during a diurnal tension curve (DTC).

Design: Case series.

***Participants*: Twenty-five** eyes of 15 POAG patients that showed no visual field (VF) progression in their last three years follow up and 29 eyes of 17 POAG patients that showed progressive VF defect despite maximal medical tolerated therapy.

***Methods*:** All eyes were submitted to a DTC (7:00 - 19:00 - 2 hours intervals) and to a WDT performed in a standard manner with one liter of water ingestion, at 11:00 hours in a different day. In a subgroup of stable (n=12) and progressive (n=13) eyes we also performed a WDT with half a liter of water, in a different day. In all the progressive eyes, six months after additional surgical treatment, a DTC and a WDT with one liter water ingestion was performed, and a half liter WDT was repeated in the 13 progressive eyes in which it was performed initially, as described before.

***Main outcome measures*:** IOP rise after WDT. IOP fluctuation in DTC.

***Results*:** The DTC showed a mean IOP fluctuation of 5.7 and 3.2 mmHg in progressive and stable eyes, respectively. In progressive eyes the mean IOP baseline before WDT was 19.8 compared to 16.7 mmHg in stable eyes. After WDT, the mean IOP rise in progressive eyes was 8.2 mmHg when performed with one liter of water and 4.8 mmHg with half a liter, while on stable eyes the rise was 4.1 and 3.1 mmHg respectively. After successful surgical treatment achieving a mean IOP reduction of 22% from baseline, the DTC showed a mean IOP fluctuation of 2.9 mmHg. The IOP baseline before WDT was reduced to a mean of 15.9 mmHg. After WDT, the mean IOP rise was 3.9 mmHg with one liter ingestion and 2.2 with half a liter.

***Conclusions*:** WDT performed with one liter of water ingestion can be a useful clinical aid in the documentation of large IOP fluctuations and in the evaluation of success of surgical treatments, in a simple, convenient and easier way if compared with the time consuming DTC. With half a liter, the IOP rise seems to be less significant.

***References*:**

1. R Susanna Jr., FA Medeiros, *et al.*, Intraocular pressure fluctuations in response to the water-drinking provocative test in patients using latanoprost *versus* unoprostone. J Ocul Pharmacol Ther. 2004 Oct;20(5):401-10. **2.** CH Chen, DW Lu, *et al.*, The application of water drinking test on the evaluation of trabeculectomy patency. J Ocul Pharmacol Ther. 2000 Feb;16(1):37-42 **3.** KS Mehra, Water drinking provocative test. Ann Ophthalmol. 1979 Feb;11(2):223-4 **4.** PR Pattisson, OJ Kun, *et al.*, Ocular hypertension and systemic responses to the water-drinking test. Br J Ophthalmol 1978 Jun;62(6):414-9. **5.** PC Kronfeld, Water drinking and outflow facility. Invest Ophthalmol. 1975 Jan;14(1):49-52.

P161 MORPHOLOGY OF CORNEAL NERVES USING CONFOCAL MICROSCOPY (CONFOSCAN 3) IN THE OPEN ANGLE GLAUCOMA.

L. Arrico[1], S. Donati[2], T. Mascaro[2], R. Pucci[2], M.C. Acconcia[2], C Morini[2]
[1]University of Rome 'La Sapienza', Rome, Italy, [2]University of Rome 'La Sapienza', Rome, Italy

Introduction: The Confoscan 3 is a new diagnostic tool used to evaluate microscopic and morphological aspects of the cornea *in vivo*. We used the Confoscan 3 (CS3) to value, *in vivo*, the microscopic corneal findings in patients affected with open angle glaucoma (POAG) and ocular hypertension (POH).

Aim of the study: Our study was particularly focused on the stromal corneal nerves morphology in the central area. The general scheme of corneal innervation is described as originating from thick and straight stromal nerve trunks that extend lateral and anteriorly and give rise to plexiform arrangements of progressively thinner nerve fibres at several levels within the stroma.

Methods: We considered 40 consecutive exams executed with the CS3, presenting four complete scans of the entire cornea: eight patients affected with open angle glaucoma (POAG) under pharmacological treatment with Timololo Maleato 0.5%, since two years; six patients with an untreated ocular hypertension (POH) IOP > 21 mmHg; six healthy subjects (N). The CS3 software allows us to execute different types of quantitative evaluations on the images stored in memory (cell density, cell area and so on) and gives for all layers: density and size of any structure founded in the different corneal layers (nerves, opacities and so on); absolute and relative depth of the image selected (derived from Z-axis in the Z-curve); reflectivity of each image selected (derived from Y-axis in the Z-curve). A quantitative and qualitative evaluation of the stromal nervous fibres was made in the three groups. The nervous fibres thickness was measured and the morphological aspects valued, classifying them in normal (N) if presenting a usual aspect or abnormal (AN) if presenting thinned, tortuous and rosary crown aspects. Quantitative measurements were expressed as mean ± SD. Categorical data were presented as absolute frequencies and percentage values. Quantitative data were analysed with Mann-Whitney test, with Bonferroni's correction. Qualitative data were analysed with the Chi-square test, p values < 0.05 were considered statisticaly significant.

Results: The mean nervous fibres thickness was 7.39 ± 1.66 mm in the N group, 6.76 ± 1.87 mm in the POH and 5.24 ± 0.77 mm in the POAG. Analysis of the quantitative data showed a statistically significant reduction of the fibres nervous thickness in the POAG group. The nervous fibres resulted thicker both in the POAG *vs* N than in the POAG *vs* POH. Multiple comparisons within the three groups, about the qualitative evaluation, did not evidence any significance, this was probably due to the exiguity of the sample.

Conclusions: The exams performed by the CS3 allows to reveal an anomalous morphology of the stromal nervous fibres in glaucomatous patients undetected by the traditional biomicroscopy. In the POH the reduction of the stromal nervous fibres thickness is present but not statistically significant. This data is probably due to the exiguity of the sample, so it needs further study in a wider population and for a longer period.

References:

1. Werner L.P., Werner L., Dighiero P. *et al.*, Confocal microscopy in Bowman and stromal corneal dystrophies. Ophthalmology 1999; 106: 1697-704. **2.** Oliveira-Soto L. and Efron N. Morphology of corneal nerves using confocal microscopy. Cornea 2001; 20(4): 374-84. **3.** Lee G.A., Khaw P.T., Ficker L. A., Shah P. The corneal thickness and intraocular pressure story: where are we now? Clinical and Experimental Ophthalmology 2002; 30: 334-7. **4.** Chiou A.G.-Y., Kaufman S.C., Beuerman R.W. *et al.* Differential diagnosis of linear corneal images on confocal microscopy. Cornea 1999; 18(1): 63-6.

9. CLINICAL FORMS

P162 AMBLYOGENIC FACTORS IN INFANTS WITH PRIMARY CONGENITAL GLAUCOMA AND SUCCESSFUL TRABECULOTOMY

M. Nakamura, Y. Tatsumi, M. Fujioka, A. Kusuhara, A. Kanamori, H. Maeda, A. Negi
Kobe University School of Medicine, Kobe, Japan

Purpose: To define amblyogenic factors in infants with primary congenital glaucoma despite successful trabeculotomy.

Design: Retrospective, noncomparative, interventional case series.

Participants: Twenty one eyes of 13 infants with primary congenital glaucoma, in which initial trabeculotomy by the first three years of life during January 1, 1989 and December 31, 1999 successfully controlled intraocular pressure (IOP) from 24.3 ± 6.7 to 14.5 ± 2.6 mmHg for at least five years.

Methods: A principle components (PC) factor analysis with varimax rotation was performed to define potentially interactive factors in visual development and amblyogeneis. The variances included were log-scaled best corrected visual acuity (BCVA), age at operation, horizontal corneal diameter, existence of corneal haze or Haab's striae, spherical equivalent or astigmatism at final exam, preoperative IOP, IOP or vertical cup/disc ratio at final exam, and eccentricity of fixation. Partial correlation coefficient was also obtained between the log-scaled BCVA and the remaining variances.

Main outcome measures: Landolt visual acuity development.

Results: A PC factor analysis yielded four factors explaining 82.1% of the total variance ($p < 0.0001$) in terms of visual development and amblyogenesis. Factor I had factor loadings of -0.919 for eccentricity of fixation, 0.870 for spherical equivalent, and 0.792 for the log-scaled BCVA, whereas those of 0.094 for vertical cup/disc ratio at final visit. Factor II had factor loadings of 0.858 for existence of Haab's striae, 0.851 for operative age (months), and 0.831 for horizontal corneal diameter, whereas 0.028 for spherical equivalent and 0.094 for eccentricity of fixation. Factor III had factor loadings of -0.892 for astigmatism and 0.833. The log-scaled BCVA had a partial correlated coefficient of 0.922 with spherical coefficient and 0.736 with eccentricity of fixation.

Conclusions: In infants with primary congenital glaucoma and successful initial trabeculotomy, maldevelopment of visual acuity was mainly associated with abnormal fixative status and the degree of myopia but not with postoperative vertical cup / disc ratio, corneal diameter, or existence of Haab's striae.

References:

1. Meyer G, Schwenn O, Pfeiffer N, Grehn F. Graefes Arch Clin Exp Ophthalmol. 2000; 238:207-13. **2.** de Souza EC, Berezovsky A, Morales PH, de Arruda Mello PA, de Oliveira Bonomo PP, Salomao SR. J Pediatr Ophthalmol Starbismus 2000; 37: 266-272. **3.** Robin AL, Quigley HA, Pollack IP, Maumenee AE, Maumenee IH. Am J Ophthalmol. 1979; 88:847-58. **4.** Filous A, Brunova B. J AAPOS. 2002; 6:182-6. **5.** Mendicino ME, Lynch MG, Drack A, Beck AD, Harbin T, Pollard Z, Vela MA, Lynn MJ. J AAPOS. 2000; 4:205-10.

P163 CONVERSION RATE OF TREATED HYPERTENSIVE EYES TO PRIMARY OPEN ANGLE GLAUCOMA IN OUR PRACTICE, AFTER LONG TERM OBSERVATION

E.A. Skoufis, D. Korogiannis, S. Georgaras
Ophthalmos Institute, Athens, Greece

***Introduction*:** Ocular hypertension (OHT) is the precursor of the primary open angle glaucoma (POAG). The dilemma is 'Which is the best time and the ideal medical therapy for treatment?'.

Purpose: a) Our goal is to assess and to evaluate the efficacy of the medical therapy in OHT b) To describe and analyse base line demographic and clinical factors that predict the conversion of OHT to POAG c) The possibility to have under control the risk factors, to prevent and to delay the conversion of OHT to POAG.

***Design & participants*:** We conducted a prospective observational comparative study of 300 patients aged from 40-65 years, randomized clinical trial, that we separated into three groups: I) Low-risk**,** II) high risk**,** III) undisciplined.

Methods & main outcome measures: The period of observation was 1-6 years (October 98-October 04), 105 male (42%), 145 female patients (58%). We determined eligibility from a comprehensive eye examination, medical ocular and familiar history, myopia >3D cup/disk ratio, VF (visual field) testing, central corneal thickness measurement (CCT), ocular blood flow analysis (OBFA), scanning laser ophthalmoscopy (SLO-HRT). Medicines used were entered into a database. The results were analyzed using paired T-test.

***Results*:** Statistically significant differences were found between three groups ($p<0,001$) **,** I) In LRG: 155 patients (65M-90F), one case converted in POAG (0,65%) **,** II) In HRG: 95 patients (40M-55F), four (4) cases converted in POAG (3F-1M), (4,21%) **,** III) In UNDISCIPLINED GROUP: was 50 patients (20M-30F) ten (10) cases converted in POAG (20%) three (3) were males and seven (7) females. Women are at higher risk than men. We observed statistically significant correlation between CCT+SLO-HRT, BFA, VF and the possibility to convert OHT into POAG ($p\leq0,005$). CCT <550mM is the big factor risk, is the 'Index conversion' OHT in POAG. In monotherapy with prostaglandins (XALATAN or TRAVATAN), we had reduced the IOP :26,2%. After therapy with COSOPT eye drops, the reduction of the IOP was 28,0% and the improvement of choroidal ocular perfusion in OBFA was 25,5%. In combination therapy: COSOPT,

XALATAN IOP was reduced 28,9%. In our study the mean base line IOP greater than 26mm Hg is a high risk for developing glaucoma.
Conclusion: The classification of the individual data of the patients and the type of risk factor is an important problem. The big risk factor is CCT and the aggravation factors are especially: IOP, SLO, OBF. They should not ignore some vascular disorders. OHTS established that correctly medically treated ocular hypertension is efficacious in delaying or preventing glaucoma.
References:
1. B.Boyd MD, PROF. M. Luntz Innovations in the Glaucoma therapy 2000 **2.** Kuldev Sineh MD, R.D Bautosta MD Advances in Glaucoma therapy **3.** Glaucoma 200-2001 AAO-San Francisco **4.** Gordon MP, Beiser JA. O.H.T.S. Arch. Ophth. 2002,.120 **5.** Brandt JD, Beiser JA Central Corneal Thickness in the OHTS Ophthalmology 2001,108

P164 VALIDATION OF A PREDICTIVE MODEL TO ESTIMATE THE RISK OF CONVERSION FROM OCULAR HYPERTENSION TO GLAUCOMA
F.A. Medeiros, R.N. Weinreb, P.A. Sample, C.F. Gomi, C. Bowd, J.G. Crowston, L.M. Zangwill
Hamilton Glaucoma Center, La Jolla, CA, United States of America

Purpose: To develop a predictive model for the risk of conversion from ocular hypertension (OHT) to glaucoma and to evaluate its validity in an independent population of untreated OHT subjects.
Design: Cohort study.
Participants: 252 eyes of 126 untreated OHT patients with baseline intraocular pressure (IOP) greater than or equal to 24mmHg in one eye and greater than or equal to 21mmHg in the other eye, normal visual fields on standard automated perimetry, and normal optic discs as evaluated by stereophotography.
Methods: Predictive models for the 5-year risk of conversion from OHT to glaucoma were derived from published results of the Ocular Hypertension Treatment Study (OHTS) using Cox proportional hazards regression. The performance of these models was assessed in an independent population from a longitudinal prospective study (Diagnostic Innovations in Glaucoma Study – DIGS). Data on baseline risk factors for development of glaucoma, including age, IOP, central corneal thickness (CCT), vertical cup disc ratio (VCD), pattern standard deviation (PSD) and presence of diabetes mellitus were assessed for each patient.
Main outcome measures: The performance of the OHTS-derived predictive models was assessed in the DIGS cohort according to equality of regression coefficients (hazard ratio comparison), discrimination (c-index) and calibration (comparison between observed and predicted outcomes).
Results: 31 (25%) of 126 OHT patients developed glaucoma during follow-up. Mean follow-up time was 86 months (range: 14 to 198 months), with a five-year cumulative probability of glaucoma development of 11.6%. 17 (55%) patients developed progression of optic disc, ten (32%) developed repeatable abnormal visual fields and four (13%) developed both. Hazard ratios for DIGS- and OHTS-derived predictive models were similar for age, IOP, CCT, VCD and PSD, but were significantly different for the presence of diabetes mellitus. When applied to the DIGS population, the OHTS-derived predictive model excluding VCD and PSD performed better than the model containing all variables (c-indexes of 0.73 and 0.68, respectively) and had better calibration, with maximum absolute difference of 4% between predicted and observed probabilities.
Conclusion: OHTS-derived predictive models performed well in assessing the risk of glaucoma development in an independent population of untreated OHT subjects. A simple risk scoring system was developed which allows calculation of the five-year risk of glaucoma development for an individual patient.
References:
1. Zangwill LM, Weinreb RN, Berry CC, *et al.* The confocal scanning laser ophthalmoscopy ancillary study to the ocular hypertension treatment study: study design and baseline factors. Am J Ophthalmol 2004;137:219-27. **2.** Zangwill LM, Weinreb RN, Berry CC, *et al.* Racial differences in optic disc topography: baseline results from the confocal scanning laser ophthalmoscopy ancillary study to the ocular hypertension treatment study. Arch Ophthalmol 2004;122:22-8. **3.** Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714-720; discussion 829-830. **4.** Wollstein G, Garway-Heath DF, Hitchings RA. Identification of early glaucoma cases with the scanning laser ophthalmoscope. Ophthalmology 1998;105:1557-63. **5.** Bowd C, Zangwill LM, Medeiros FA, et al. Confocal scanning laser ophthalmoscopy classifiers and stereophotograph evaluation for prediction of visual field abnormalities in glaucoma-suspect eyes. Invest Ophthalmol Vis Sci 2004;45:2255-62.

P165 BASELINE TOPOGRAPHIC OPTIC DISC MEASUREMENTS ARE ASSOCIATED WITH THE DEVELOPMENT OF PRIMARY OPEN ANGLE GLAUCOMA: THE CONFOCAL SCANNING LASER OPHTHALMOSCOPY ANCILLARY STUDY TO THE OHTS
L.M Zangwill, R.N. Weinreb, J.A. Beiser, C.C. Berry, G.A. Cioffi, A.L. Coleman, G.L. Trick, J.M. Liebmann, J.D. Brandt, J.R. Piltz-Seymour, K.A. Dirkes, S. Vega, M.A. Kass, M.O. Gordon
University of California, San Diego, La Jolla, CA, United States of America

Purpose: To determine whether baseline confocal scanning laser ophthalmoscopy (CSLO) optic disc topographic measurements are associated the development of primary open angle glaucoma (POAG) in individuals with ocular hypertension.
Methods: Eight hundred and sixty five eyes from 438 participants in the CSLO Ancillary Study to the Ocular Hypertension Treatment Study (OHTS) with good quality baseline CSLO images were included in this study. Each baseline CSLO parameter was assessed in univariate and multivariate proportional hazards models to determine its association with the development of POAG.
Results: Forty-one eyes from 36 CSLO Ancillary Study participants developed POAG. Several baseline topographic optic disc measurements were significantly associated with the development of POAG in both univariate and multivariate analysis including larger cup-to-disc area ratio, mean cup depth, mean height contour, cup volume, reference plane height, and smaller rim area, rim area to disc area, and rim volume. In addition, classification as 'outside normal limits' by the Heidelberg Retina Tomograph (HRT) 'Classification' and the Moorfields Regression Analysis (MRA) (overall, global, temporal inferior, nasal inferior and superior temporal regions) classifications were significantly associated with the development of POAG. Within the follow-up period of this analysis, the predictive value of a positive test of CSLO indices, ranged from 14% (HRT Classification and MRA Overall) to 40% for MRA temporal superior.
Conclusion: Several baseline topographic optic disc measurements alone or when combined with baseline clinical and demographic factors were significantly associated with the development of POAG among OHTS participants. Longer follow-up is required to evaluate the true predictive accuracy of CSLO measures.
References:
1. Zangwill LM, Weinreb RN, Berry CC, *et al.* The confocal scanning laser ophthalmoscopy ancillary study to the ocular hypertension treatment study: study design and baseline factors. Am J Ophthalmol 2004;137:219-27.**2.** Zangwill LM, Weinreb RN, Berry CC, *et al.* Racial differences in optic disc topography: baseline results from the confocal scanning laser ophthalmoscopy ancillary study to the ocular hypertension treatment study. Arch Ophthalmol 2004;122:22-8. **3.** Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714-720; discussion 829-830. **4.** Wollstein G, Garway-Heath DF, Hitchings RA. Identification of early glaucoma cases with the scanning laser ophthalmoscope. Ophthalmology 1998;105:1557-63. **5.** Bowd C, Zangwill LM, Medeiros FA, *et al.* Confocal scanning laser ophthalmoscopy classifiers and stereophotograph evaluation for prediction of visual field abnormalities in glaucoma-suspect eyes. Invest Ophthalmol Vis Sci 2004;45:2255-62.

P167 PREVALENCE OF MIGRAINE IN PRIMARY OPEN-ANGLE GLAUCOMA IN THE POPULATION OF POLISH GLAUCOMA PATIENTS
M.A. Pilas-Pomykalska, J. Czajkowski
Polish Mother's Health Centre - Research, Lodz, Poland

Purpose: To evaluate the association of high pressure glaucoma (POAG/HPG) and normal-pressure glaucoma (POAG/NPG) with migraine headache.
Design: Cross-sectional study.
Participants: 11 746 patients with primary open-angle glaucoma (10 059 patients with high pressure glaucoma and 1 687 patients with normal-pressure glaucoma) from all regions of Poland were enrolled into the study.
Methods: Subjects were analyzed by means of a standardized questionnaire based on International Headache Society criteria. The examinations were performed by ophthalmologists in their outpatient clinics.
Main outcome measures: Primary open-angle glaucoma was defined by the presence of both characteristic visual field defects and optic disc damage in eyes with open angles in the absence of history or signs of secondary glaucoma. A distinction was made between high tension glaucoma and normal tension glaucoma. The diagnosis of migraine headache was based on participant responses to specific questions, consistent with International Headache Society criteria.
Results: According to the questionnaire, 2 072 patients with POAG (17,64%) were classified as suffering from migraine headache. The migraine was significantly more common in patients with normal-pressure glaucoma (30,11%) compared to patients with high pressure glaucoma (15,55%; P<0,01).
Conclusions: In the population of Polish glaucoma patients prevalence of migraine was significantly higher in NTG patients (30,11%) than in HPG patients (15,55%). The results suggest a relationship between normal pressure glaucoma and migraine and a potential, common vascular etiology of both diseases.
***References*:**
1. Cursiefen C, Wisse M, Cursiefen S, Junemann A, Martus P, Korth M. Migraine and tension headache in high-pressure and normal-pressure glaucoma. Am J Ophthalmol. 2000 Jan;129(1): 102-4. **2.** Klein BE, Klein R, Meuer SM, Goetz LA. Migraine headache and its association with open-angle glaucoma: the Beaver Dam Eye Study. Invest Ophthalmol Vis Sci. 1993 Sep;34(10): 3024-7. **3.** Pradalier A, Hamard P, Sellem E, Bringer L. Migraine and glaucoma: an epidemiologic survey of French ophthalmologists. Cephalalgia. 1998 Mar;18(2):74-6. **4.** Usui T, Iwata K, Shirakashi M, Abe H. Prevalence of migraine in low-tension glaucoma and primary open-angle glaucoma in Japanese. Br J Ophthalmol. 1991 Apr;75(4):224-6. **5.** Wang JJ, Mitchell P, Smith W. Is there an association between migraine headache and open-angle glaucoma? Findings from the Blue Mountains Eye Study. Ophthalmology. 1997 Oct;104(10):1714-9. **6.** Yamamoto T, Kitazawa Y. Vascular pathogenesis of normal-tension glaucoma: a possible pathogenetic factor, other than intraocular pressure, of glaucomatous optic neuropathy. Prog Retin Eye Res. 1998 Jan;17(1):127-43. **7.** Phelps CD, Corbett JJ. Migraine and low-tension glaucoma. A case-control study. Invest Ophthalmol Vis Sci. 1985 Aug;26(8):1105-8.

P168 RACIAL VARIABILITY OF GLAUCOMA RISK FACTORS BETWEEN AFRICAN-CARRIBEAN AND CAUCASIANS IN A CANADIAN URBAN POPULATION.
P. Harasymowycz, A. Kamdeu-Fansi, D. Papamatheakis
Université de Montréal, Montréal, Quebec, Canada

Purpose: To determine the impact of the African-Carribean race on the variability of risk factors for glaucoma and ocular hypertension in an urban Canadian population.
Design: Prospective non-consecutive populational glaucoma screening study.
Participants: Three hundred participants in a high-risk glaucoma screening clinic. Subjects were included if they fulfilled one or more of the following criteria: a) Caribbean or African descent and/or, b) Above 50 years of age and/or c) Positive family history for Open Angle Glaucoma.
Methods: Patients underwent complete ophthalmic examination including visual acuity, corneal pachymetry (CCT), intraocular pressure (IOP) measurement, gonioscopy, slit lamp and dilated fundoscopic examination, as well as imaging of the optic nerve with confocal scanning laser ophthalmoscopy (HRT II).
Outcome Measures: These included IOP, CCT, grading of the optic nerve based on the Disk Damage Likelihood Scale (DDLS)[1] and cup/disc ratio, HRT parameters (disc area, cup area, rim area , cup/disc area ratio, rim/disc area ratio) including Cup Shape Measure (CSM), Height Variation Contour (HVC) and Mean Retinal Nerve Fiber Layer Thickness (MRNFLT). Statistical analysis was performed with SAS software, and only results that were repeated in both eyes were considered statistically significant.
Results: Of 274 patients screened, racial breakdown included 59 Afro-Caribbeans (22%), and 199 Caucasians (72%). Although there was no significant difference between Female/Male ratio between racial groups, Caucasians were significantly older (Mean=66.2 year) than Afro-Caribbeans (Mean=55.1 years), p=0.001. Patients of African-Caribbean descent had statistically significant higher IOP (p<0.001), thinner CCT (p<0.001), greater cup/disc ratio (p=0.016), disc area (p<0.001), cup area (p=0.002), Cup/disc area ratio (p=0.009), and smaller rim/disc area ratio (p=0.009). No statistical differences were found between race and CSM, HVC, and MRNFLT.
Conclusion: The above results demonstrate that in a Canadian urban setting, African-Caribbean race is associated with an increased number of risk factors for the development of open-angle glaucoma, includng higher IOP, thinner CCT, and larger cup-to-disc and cup-to-disc area ratios. Other studies have suggested similar results[2-5].
References:
1. Bayer A, Harasymowycz P, Henderer JD *et al.* Validity of a new disk grading scale for estimating glaucomatous damage: correlation with visual field damage. Am J Ophthalmol 2002;133: 758-63. **2.** Girkin CA, McGwin G Jr, Xie A, Deleon-Ortega J. Differences in optic disc topography between black and white normal subjects. Ophthalmology 2005;112:33-9. **3.** Zangwill LM, Weinreb RN, Berry CC, *et al*, for the Confocal Laser Ophthalmoscopy Ancillary Study to the Ocular Hypertension Treatment Study. Racial differences in Optic disc topography:Baseline Results from the Confocal Laser Ophthalmoscopy Ancillary Study to the Ocular Hypertension Treatment Study. Arch Ophthalmol 2004;122:22-8. **4.** Shimmyo M, Ross AJ, Moy A, Mostafavi R. Intraocular pressure, Goldmann applanation tension, corneal thickness, and corneal curvature in Caucasians, Asians, Hispanics, and African Americans. Am J Ophthalmol 2003;136:603-13. **5.** Leske MC, Connell AM, Wu SY, *et al.* Distribution of intraocular pressure. The Barbados Eye Study. Arch Ophthalmol 1997;115:1051–7.

P169 RECURRENT OPTIC DISC HEMORRHAGES AND THE PROGRESSION OF GLAUCOMA
K.H. Park[1], S.H. Kim[1], D.M. Kim[1], T.W. Kim[2]
[1]Seoul National University Hospital, Seoul, South-Korea, [2]SNU Bundang Hospital, Sungnam, South-Korea

Introduction: Optic disc hemorrhage was known to be associated with the progression of glaucoma. However, there were controversies about the effect of recurrent optic disc hemorrhages.
Aim of the study: To compare the clinical characteristics and the progression rate of glaucoma between the patients with recurrent and non-recurrent optic disc hemorrhages.
Methods: The medical records of 57 eyes of 54 patients with optic disc hemorrhage were retrospectively reviewed. The patients had been followed up regularly with 1-3 months interval

between 1991 and 2003 for more than one year after the first hemorrhage. Non-recurrent group was defined as having one episode of disc hemorrhage while recurrent group as having two or more episodes of hemorrhages. Mean follow-up period of non-recurrent group was 54.7 months while that of recurrent group was 67.5 months.
Results: Twenty-six eyes (45.6%) showed recurrent and thirty-one eyes (54.4%) showed non-recurrent hemorrhages. Normal tension glaucoma was the most common type of glaucoma in both recurrent and non-recurrent group. Inferotemporal area was the most common location of disc hemorrhage in both groups. There were no differences in prevalence of associated systemic diseases between both groups. The cumulative probability of progression of optic disc change was significantly greater for patients with recurrent disc hemorrhages than for patients with non-recurrent disc hemorrhage (p=0.005, log rank test). However, no significant difference was found in the rate of progressive visual field defects in eyes with recurrent disc hemorrhages compared with eyes with non-recurrent disc hemorrhage (p=0.10, log rank test).
Conclusion: Recurrent group showed greater probability of progressive change of optic disc than non-recurrent group although visual field change was not different between two groups. Further study must be made with a large number of patients and longer follow-up period.
References:
1. Siegner SW, Netland PA. Optic disc hemorrhages and progression of glaucoma. Ophthalmology 1996;103:1014-24. **2.** Rasker MT, van den Enden A, Bakker D, *et al.* Deterioration of visual fields in patients with glaucoma with and without optic disc hemorrhages. Arch Ophthalmol 1997;115:1257-62. **3.** Ishida K, Yamamoto T, Sugiyama K, *et al.* Disk hemorrhage is a significantly negative prognostic factor in normal-tension glaucoma. Am J Ophthalmol 2000;129:707-14.

P170 THE OPTIC CHIASM THICKNESS OF GLAUCOMA AND OCULAR HYPERTENSION PATIENTS

E.F. Baser, A.B. Toprak, S. Orguc, I. Kurultay, C. Guler
Celal Bayar University Hospital, Manisa, Turkey

Introduction: Glaucoma affects the anterior visual pathway, and these morphologic changes in the anterior visual pathway are correlated with glaucomatous optic nerve damage[1,2].
Aim of the study: To investigate the relation between optic disc tomographic values and optic chiasm height in patients with glaucoma and ocular hypertension (OH).
Methods: Twelve glaucoma patients and 13 ocular hypertension patients were recruited, and informed consent was obtained. Visual field analysis was performed with Humphrey Statpac® program 30-2. Optic disc parameters were obtained using Heidelberg Retinal Tomograph (HRT II) system. Magnetic resonance imaging examinations were performed with an open MRI system (Gyroscan, 0.23T, Philips Medical Systems, The Netherlands) using axial and parasagittal GRE T1 and coronal TSE T2 sequences. The thickness of the optic chiasm was measured on both sides using electronic calipers.
Results: There was no significant difference in terms of age among groups (p=0.54). There was a significant difference in terms of chiasmal height (CH) between glaucoma and OH patients (p=0.003). Mean CH of the glaucoma patients was 1.68±0.577 mm (mean±SD) and the CH of OH patients was 2.47±0.77 mm (mean±SD). There was a significant difference in terms of mean deviation between study groups (p=0.002). The measured optic disc parameters were; disc area, cup area, cup volume, rim volume, cup/disc area ratio, linear cup/disc ratio, mean cup depth, mean retinal nerve fibre layer (RNFL) thickness , and mean RNFL thickness.There was no correlation between any of the HRT parameters and CH for glaucoma and OH patients (p>0.05, and p>0.05 respectively).
Conclusion: The optic chiasm height in glaucoma patients was significantly different from those in OH patients. These results are consistent with those of previous reports which have shown a difference between glaucoma patients and controls[3-5]. Chiasma height may be a predictor of glaucomatous optic atrophy. There is no relation between HRT parameters and chiasmal height, further studies with more patients may resolve the presence of such a relation.
References:
1. Kashiwagi K, Okubo T, MD,Tsukahara S. Association of Magnetic Resonance Imaging of Anterior Optic Pathway with Glaucomatous Visual Field Damage and Optic Disc Cupping. J Glaucoma 2004;13:189–195. **2.** Iwata F, Patronas NJ, Caruso RC, *et al.* Association of visual field, cupdisc ratio, and magnetic resonance imaging of optic chiasm. Arch Ophthalmol 1997;115: 729–732. **3.** Beatty S, Good PA, McLaughlin J, *et al.* Correlation between the orbital and intraocular portions of the optic nerve in glaucomatous and ocular hypertensive eyes. Eye. 1998;12:707–713. **4.** Beatty S, Good PA, McLaughlin J, *et al.* Echographic measurements of the retrobulbar optic nerve in normal and glaucomatous eyes. Br J Ophthalmol. 1998;82:43–47. **5.** Parravano JG, Toledo A, Kucharczyk W. Dimensions of the optic nerves, chiasm, and tracts: MR quantitative comparison between patients with optic atrophy and normals. J Comput Assist Tomogr. 1993;17:688–690.

P171 THE ASSOCIATION OF PRIMARY OPEN-ANGLE GLAUCOMA AND MIGRAINE HEADACHE

T. Sharma[1], J.F. Salmon[2]
[1]Oxford Eye Hospital, Oxford, United Kingdom, [2]Oxford Radcliffe Hospitals, Oxford, United Kingdom

Introduction: In literature, some work link open-angle glaucoma and migraine. A few studies[1] suggest the possibility of an association between history of typical migraine headache and glaucoma, which could be modified by age, while other studies[2] found no association between migraine and glaucoma.
Aim: To investigate the relationship of a history of migraine headache to open angle glaucoma.
Methods: A case control analysis was performed from the database of Oxford eye hospital. The data for all the new patients seen in the glaucoma screening clinic in the last 10 years, was collected. The diagnosis of glaucoma was based on a typical optic disc appearance and corresponding visual field abnormality irrespective of intraocular pressure. 224 patients with a history of migraine headache (group-1) were age, gender matched with normal individual without the history of migraine (226 patients, group-2).
Results: Mean age in group-1 was 59.78 (S.D±12.5, Range-29-89) and was 60.65 (S.D±12.1, Range 37-85) in the group-2. 13.39% (30 patients) in group-1 were diagnosed to have glaucoma while 9.33% (21) patients had glaucoma in the control group *i.e.* group-2. The difference in the two groups was statistically significant (p=0.034). 50% of glaucoma patients with history of migraine were diagnosed to have normal tension glaucoma.
Conclusion: These data suggest an association between history of typical migraine headache and open-angle glaucoma.
References:
1. Is there an association between migraine headache and open-angle glaucoma? Finding from the Blue Mountains Eye Study. Wang JJ, Mitchell P, Smith W. Ophthalmology. 1997;104(10): 1714-9. **2.** Migraine & glaucoma: an epidemiologic survey of French ophthalmologists. Pradalier A, Hamard P, Sellem E, Bringer L. Cephalalgia. 1998; 18(2):74-6. **3.** Migraine headache and its association with open-angle glaucoma: the Beaver Dam Eye Study. Klein BE, Klein R, Meuer SM, Goetz LA. Invest Ophthalmol Vis Sci.1993;34(10):3024-7. **4.** Prevalence of Migraine in low-tension glaucoma and primary open-angle glaucoma in Japanese. Usui T, Iwata K, Shirakashi M, Abe H. Br J Ophthalmol.1991;75(4):224-6. **5.** Risk factors associated with the incidence of open-angle glaucoma: the visual impairment project. Le A, Mukesh BN, McCarty CA, Taylor HR. Invest Ophthalmol Vis sci.2003;44(9):3783-9

P172 INFLUENCE OF VASCULAR DISORDERS ON VISUAL FIELD PROGRESSION IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

P. Hentova-Sencanic
Clinical center of Serbia, Belgrade, Serbia

Introduction: Pressure independent vascular disorders may contribute to glaucoma pathogenesis.
Aim of the study: To compare the frequency of vascular disorders between the patients with and without progression of visual field defects.
Methods: Prospective non-randomized clinical study was conducted. Sixty four patients were followed-up for mean 48.8 ± 17.8 months. Every patient performed mean 7.1 ± 1.3 computerized visual fields (Octopus 500EZ). The rate of change of the visual field was measured by linear regression analysis and Spearman p value of the correlation coefficient was calculated. Significant progression of visual field defects experienced 11 patients while 53 patients had stable visual fields. The frequency of diabetes mellitus, myocardial infarction, angina, systemic hypertension, systemic hypotension, cerebral ischemic changes, reduced fingertip cutaneous capillary perfusion and haemodynamic crisis was compared between the group with progressive visual field loss and group with stable visual field. Pearson chi-square test was used to test the statistical significance of differences in vascular parameters between the group with progressive visual field loss and group with stable visual field.
Results: Significantly more glaucoma patients with progressive visual field loss (27.3%) had fingertip vasospasm than patients with stable visual field (3.8%) (p=0.008). Patients with progressive visual field loss had more often haemodynamic crisis (27.3%) than patients with stable visual fields (5.7%) but statistical significance was borderline (p=0.065).
Conclusion: Systemic vascular parameters could contribute to the visual field progression in glaucoma patients.
References:
1. Bonovas S, Peponis V, Filioussi K. Diabetes mellitus as a risk factor for primary open-angle glaucoma; A meta analysis. Diabetic Medicine 2004;21:609-14. **2.** Drance SM, Schulzer M, Thomas B. Multivariate analysis in glaucoma. Use of discriminant analysis in predicting glaucomatous visual field damage.Arch Ophthalmol 1981;99:1019-22. **3.** Emre M, Orgul S, Gugleta K, Flamer J. Ocular blood flow alteration in glaucoma is related to systemic vascular dysregulation. Br J Ophthalmol 2004;88:662-6. **4.** Mitchell P, Lee AJ, Rochtchina E, Wang JJ. Open-angle glaucoma and systemic hypertension: the blue mountains eye study. Journal of Glaucoma 2004;13:319-26. **5.** O'Brien C, Schwartz B. The visual field in chronic open angle glaucoma: the rate of change in different regions of the visual field. Eye 1990;4:557-62

P173 RELATIONSHIP BETWEEN HELICOBACTER PYLORI INFECTION AND PRIMARY OPEN ANGLE GLAUCOMA

L. Quaranta[1], M. Negrini[2], R. Turano[1], E. Gandolfo[1]
[1]Clinica Oculistica, Brescia, Italy, [2]Istituto di Microbiologia, Brescia, Italy

Objective: To determine the frequency of Helicobacter pylori (HP) infection in primary open angle glaucoma patients (POAG) and in healthy control participants.
Design: Prospective, comparative study.
Patients: Twenty five consecutive patients affected with POAG that have to undergo trabeculectomy (25 eyes). Twenty-six consecutive patients that have to undergo catarct surgery served as control group (26 eyes).
Methods: Samples of blood and aqueous humor were collected at the time of surgery in all patients. In POAG group sclero-corneal blocks were collected for immunohystochemical analysis, to detect the presence of autoantibodies directed toward trabecular meshwork. The HP serologic and aqueous humor analysis were determined by ELISA.
Results: Fourteen (56%) of the 25 POAG patients, and 17 (63.5%) of the 26 patients of the control group showed serologic HP infection (Student *t* test: p=0.694). The concentration of antibodies was not different in the two group either in the serum either in the aqueous humor. The search for autoantibodies toward trabecular meshwork was negative.
Conclusions: The results of the present investigation showed that HP infection has similar frequency in POAG and control groups. Negative results were obtained for the detection of autoantibodies direct toward trabecular meshwork.
***References*:**
1. Galloway PH, Warner SJ, Morshed MG, Mikelberg FS. Helicobacter pylori infection and the risk for open-angle glaucoma. Ophthalmology 110:922-5,2003 **2.** Kountoras J, Mylopoulos N, Chatzopoulos D, *et al.* Eradication of Helicobacter pylori may be beneficial in the management of chronic open-angle glaucoma. Arch Intern Med 162:1237-44,2002 **3.** Kountouras J, Mylopoulos N, Boura P, *et al.* Relationship between Helicobacter pylori infection and glaucoma. Ophthalmology 108: 599?604,2001.

P174 MIGRAINE AND VASCULAR DYSREGULATION IN THE PATHOGENESIS OF THE GLAUCOMAS

G Gramer, E Gramer
University Würzburg, Würzburg, Germany

Purpose: To evaluate 1. the frequency of migraine (MI) and family history (FH) of MI in patients with glaucoma (GL) or ocular hypertension (OH). 2. whether there is any difference in the frequency of MI in different types of GL compared to Normal Tension GL (NTG). 3. the frequency of MI in relation to the stage of visual field loss (VFL) in patients with Primary Open Angle GL (POAG) and NTG. 4. the frequency of MI in glaucoma patients with a vasospastic syndrome (VS).
Design: Retrospective case controlled study with prospective questionnaire study.
Participants: Of 2027 patients who provided a yes or no answer on MI diagnosis, 1244 had POAG, 140 NTG, 49 pigmentary GL (PG), 64 PEX, 138 OH and 218 PACG. 174 patients had other types of GL, which are not evaluated here due to small sample sizes. 1952 patients provided a yes or no answer of the diagnosis of a vasospastic syndrome.
Methods: By means of a questionnaire addressed to patients and their ophthalmologists, GL patients were interviewed using detailed standardized questions, concerning *e.g.* FH of GL (FHG), type of GL, stage of VFL, age at the time of diagnosis and potential risk factors, such as heart disease, vasospasm and migraine. Patients interviewed their relatives whether GL or OH was found or excluded. Fisher's exact test two-sided, Likelihood Ratio chi-square test and Mantel-Haenszel chi-square test were used for statistics. Regarding the stage of VFL, we divided our patients into two groups, with no or beginning VFL (stages 0-II, classification of Aulhorn) or moderate to severe VFL (stages III-V).
Main outcome measures: Differences in the frequency of MI in the glaucomas compared to NTG, in patients with and without FHG, in the relation to the stage of the disease in POAG and NTG, in glaucoma patients with the diagnosis VS.
Results: 1. Of 2027 patients, 13.7% (277) have MI. A FH of MI was reported by 30.8%, a FHG by 40.0%. Patients with FHG have a significantly higher frequency of MI than patients without FHG (15.7% *vs.* 12.3%, p = 0.0249) and are significantly younger. 2. The frequency of MI for POAG was 13.1%, NTG 21.4%, PG 24.5%, OH 13.8%, PEX 7.8% and PACG 10.1%. There was a significant difference between the MI frequency in POAG and NTG (13.1% *vs.* 21.4%, p = 0.0098), and between PEX and NTG (7.81% *vs.* 21.4%, p = 0.0166). There was no significant difference of MI in OH and NTG (13.7% *vs.* 21.4%, p = 0.1154), and between PACG and NTG (10.1% *vs.* 21.4%, p = 0.0035). 3. Of 76 NTG patients with VFL stages 0-II, 21% and of 58 patients with stages III-V, 20.7% have MI. Of 964 POAG patients with stages 0-II, 13.1% and of 259

patients with stages III-V, 12.7% have MI. There is no significant difference in the frequency of MI between patients with beginning compared to patients with severe VFL in POAG (p=0.6077) and NTG (p=0.6025). 4. MI was more frequent in patients with VS (31,1%, 84 of 270) compared to those without VS (16,8%, 282 of 1682)(p<0,0001).
Conclusions: The frequency of GL increases and of MI decreases with age. Inspite of no significant age difference between POAG and NTG patients, MI is significantly more frequent in NTG compared to POAG. This suggests an association of NTG and MI and a common, possibly polygenetic, vascular aetiology of these two diseases with familial predisposition. Regarding the extent of VFL in GL, MI is not a prognostic factor.
References:
1. Gramer G, Gramer E, Weber BHF, Evaluation of 2170 patients with glaucoma or ocular hypertension - Disease risk in siblings and children , IOVS 2004;45:ARVO E-Abstract 863 **2.** Patel NV, Bigal ME, Kolodner KB *et al.* Prevalence and impact of migraine and probable migraine in a health plan. Neurology. 2004 Oct 26;63(8): 1432-8 **3.** Gramer E, Gramer G, A New Unification Hypothesis of the Pathogenesis of Glaucomas based on clinical studies on Disc Appearance in Relation to the Stage of Visual Field Loss in Different Types of Glaucoma in: E Gramer, F Grehn, Pathogenesis and Risk Factors of Glaucoma, Chapter 20, pp 170-204, Springer Berlin, New York, 1999 **4.** Weisschuh N, Neumann D, Wolf C,Wissinger B, Gramer E, Prevalence of Myocilin and Optineurin Sequence Variants in German Normal Tension Glaucoma Patients, IOVS 2005,46: ARVO E-Abstract 32 **5.** Flammer J, Haefliger IO, Orgül S, Resink T, Vascular Dysregulation: A Principal Risk Factor for Glaucomatous Damage?, Journal of Glaucoma 1999, 8:212-219

P175 DIURNAL VARIATION OF INTRAOCULAR PRESSURE IN SUSPECTED NORMAL-TENSION GLAUCOMA
T Yamamoto, K Hasegawa, A Sawada, K Ishida, K Kawase
Gifu University Graduate School of Medic, Gifu-shi, Japan

Purpose: To identify the features of diurnal variation of intraocular pressure (IOP) in normal-tension glaucoma (NTG).
Design: Retrospective study.
Participants: A total of 569 patients diagnosed as NTG suspects at our outpatient clinic between 1989 and 2003 based on structural and functional abnormality indicating glaucoma but lacking high IOP (> 20 mmHg) and underlying pathology.
Intervention: Goldmann applanation tonometry was repeatedly performed for 24 hrs at 2-hr intervals without medication or after 4-week discontinuation of all medications.
Main outcome measure: 24-hr IOP variation.
Results: Thirty patients (5%) showed high IOP (≥ 21 mmHg) at least one eye during the IOP phasing. In the remaining 539 established NTG cases, the average, maximum and minimum IOPs were 13.9 ± 2.0 mmHg (mean ± SD), 16.1 ± 2.2 mmHg, and 11.7 ± 2.1 mmHg, respectively. The diurnal variation ranged from 1 to 10 mmHg and averaged 4.4 ± 1.6 mmHg. The peak IOP was recorded during 0800-1600 hrs in 66.6% of the cases and the trough during 2400-0400 hrs in 44.2%. Of 554 patients excluding 15 cases with PE materials and showing all IOPs during office hours (1000-1600) within 20 mmHg, 13 patients (2.3%) showed an IOP over 20 mmHg at least once outside of the office hours.
Conclusions: Basic features of diurnal IOP variation have been elucidated in NTG suspects. Approximately 5% of NTG suspects showed IOP over 20 mmHg during 24-hr IOP phasing.
References:
1. Yamagami J, Araie M, Aihara M, Yamamoto S: Diurnal variation in intraocular pressure of normal-tension glaucoma eyes. Ophthalmology 100: 643-650, 1993 **2.** Wilensky JT, Gieser DK, Dietsche ML, Mori MT, Zeimer R: Individual variability in the diurnal intraocular pressure curve. Ophthalmology 100: 940-944, 1993 **3.** Liu JHK, Kripke DF, Hoffman RE, Twa MD, Loving RT, *et al*: Nocturnal elevation of intraocular pressure in young adults. Invest Ophthalmol Vis Sci 39: 2707-2712, 1998 **4.** Zeimer RC, Wilensky JT, Gieser DK, Viana MAG: Association between intraocular pressure peaks and progression of visual field loss. Ophthalmology 98: 64-69, 1991 **5.** Asrani S, Zeimer R, Wilensky J, Gieser D, Vitale S, Lindenmuth K: Large diurnal fluctuations in intraocular pressure are an independent risk factor in patients with glaucoma. J Glaucoma 9: 134-142, 2000

P176 THE OPTIC DISC SIZE IN NORMAL TENSION GLAUCOMA
Dj. Kontic[1], V. Markovic[1], M. Beko[1], M. Milovic[1], M. Kontic[2]
[1]University Eye Clinic, Belgrade, Serbia, [2]Military Medical Academy, Belgrade, Serbia

Aim: The aim of this study was to compare the optic disc size in normal-tension glaucoma 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.
Method: We evaluated 48 eyes with normal-tension glaucoma (NTG) and 235 healthy eyes. Refractive error was less than five dioptres. The optic disc parameters (stereo metric and volumetric) were measured using a computerized imaging system - HRT II. Disc area, rim area, cup area, cup volume, cup-disc area ratio of the optic disc were selected for evaluation. 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. All normal subjects (n=235) 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 five dioptres from emmetropia.
Results: In normal eyes, the optic disc size shows a high interindividual variability. The optic disc size were significantly larger in patients with normal-tension glaucoma than in healthy persons (p< 0.001).
Conclusion: The optic disc in normal tension glaucoma is high significantly lager than in normal population and it could be possible that the lager optic disc are more sensitive on glaucomatous optic neuropathy.

P177 PROSPECTIVELY COMPARISON STUDY ON MANAGEMENT OF PRIMARY ANGLE-CLOSURE GLAUCOMA BY THREE TYPES OF MICROSURGERY
J Ge, XL Zhang
Zhongshan Ophthalmic Center, Guangzhou, China

Objective: To investigate the clinical results of three types of microsurgery in the management of primary angle-closure glaucoma.
Methods: The criteria of three types of microsurgery were set up for a prospective study on 72 eyes (63 cases) with primary acute or chronic angle-closure glaucoma which were performed trabeculectomy only (Trab group), Phacotrabeculectomy plus intraocular lens implantation (PhcoTrab+IOL group) and Phcoemulsification with IOL (Phco+IOL). The clinical results of three groups will be compared.
Results: After a mean postoperative follow-up 9.7 ± 4.5 months, the best-corrected visual acuity was improved in Phco+IOL group (95.0%), PhcoTrab+IOLgroup (77.3%) and Trab group (39.3%) (P=0.001); The postoperative IOP in three groups were well controlled postoperatively *vs.* preoperatively (All P <0.001). The anterior chamber depth was seen deeper in PhcoTrab+IOL and Phco+IOL group postoperatively *vs.* preoperatively (Both P <0.001), while in Trab group there was no significant change (P>0.05); The UBM showed that anterior angle was widen or reopened in PhcoTrab+IOL and Phco+IOL group. The corresponding C values in these two groups were increased postoperatively *vs.* preoperatively (P<0.001 and P<0.01, respectively). However, even though the angle was not seen reopened in Trab group under the UBM, the C value was significantly increased (P<0.001). No sever intra- and postoperative complications happened in three group. The mildest postoperative inflammatory response was seen in Phco+IOL group.
Conclusions: The criteria of three types of microsurgery will be good for management primary angle-closure glaucoma. PhcoTrab+IOL and Phco+IOLgroup have better improvement in visual acuity, angle reopened and C value. It implicates that Phcoemulsification with intraocular lens implantation can be effectively managed primary angle-closure glaucoma.

P178 PROSPECTIVELY COMPARISON STUDY ON MANAGEMENT OF PRIMARY ANGLE-CLOSURE GLAUCOMA BY TWO TYPES OF MICROSURGEY: TRABEULECTOMY, PHACO-TRABECULECTOMY WITH INTRAOCULAR LENS IMPLANTATION.
XL Zhang, J Ge, XY Cai
Zhongshan Ophthalmic Center, Guangzhou, China

Objective: To investigate the clinical results of two types of microsurgery in the management of primary angle-closure glaucoma.
Methods: The criteria of two types of microsurgery were set up for a prospective study on 50 eyes (45 cases) with primary acute or chronic angle-closure glaucoma which were performed trabeculectomy only (Trab group) or Phacotrabeculectomy+ intraocular lens implantation (PhcoTrab+IOL group). The clinical results of two groups were compared.
Results: After a mean postoperative follow-up 8.5 ± 4.0 months, the better-corrected visual acuity was improved in PhcoTrab+IOLgroup (77.3%) while Trab group was 39.3% (P=0.026); the postoperative intraocular pressure (IOP) were well controlled in both two groups compared with preoperative IOP (Both P value <0.001). The anterior chamber depth was seen deeper in PhcoTrab+IOL postoperatively *vs.* preoperatively (P <0.001). However, the depth of anterior chamber was not significantly changed postoperatively in Trab group (P>0.05); The Ultrasonic Biomicroscopy (UBM) showed that anterior angle was widen or reopened in PhcoTrab+IOLgroup. The corresponding C values (Aqueous humor outflow facility) increased postoperatively *vs.* preoperatively (P<0.001). However, even though the angle was not seen reopened in Trab group under the UBM, the C value was significantly increased postoperatively (P<0.001). No sever intra- and postoperative complications happened in two groups.
Conclusions: The criteria of two types of microsurgery will be good for management primary angle-closure glaucoma. PhcoTrab+IOL has better improvement in visual acuity, angle reopened and C value. It implicates that Phacoemulsification surgery can be effectively managed primary angle-closure glaucoma.

P179 TYPE-D PERSONALITY: A NEW RISK FACTOR FOR ACUTE PRIMARY ANGLE CLOSURE?
J. Casiraghi[1], M. Khoury[2], N. Taubenslag, DE Grigera[1]
[1]Hospital de Clínicas José de San Martín, Buenos Aires, Argentina, [2]Academia Nacional de Medicina, Buenos Aires, Argentina

Objective: To investigate the association between 'Type-D' personality and acute primary angle closure in patients with occludable narrow angles, since psychotraumatic episodes have been previously related to acute primary angle closure[1].
Design**:** Cross-sectional study.
Participants: Ninety-six patients with narrow angles (46 of which having suffered acute primary angle closure) and 48 controls with primary open angle glaucoma attending a Buenos Aires glaucoma clinic from April 2003 to September 2004 were psychologically examined at the time of their periodical follow-up.
Methods: 'Type-D' personality[2] or 'distressed' personality, describes persons who experience increased negative emotions and simultaneously tend to inhibit the expression of these emotions in social interactions[3,4]. All patients underwent a brief psychiatric interview and completed the DS-14 scale for type D personality[5].
Main outcome measures: The relationship between 'Type-D' personality and acute primary angle closure was investigated using Chi square test.
Results**:** The analysis was performed in three groups: Group 1 (n= 46) patients with narrow angles who had suffered acute primary angle closure (median age: 72 years and 40 were female); Group 2 (n=50) patients with narrow angles without acute primary angle closure (median age: 73 years and 38 were female); and Group 3 (n=48) controls with primary open angle glaucoma (median age:70,5 years and 31 were females). Type-D personality was present in 71,74% of group 1; 28% of group 2; and 41,56% of group 3 (p<0.0001).The difference between groups 2 and 3 was statistically not significant. In groups 1 an 2 (narrow angles), the association between acute closure as dependent variable and Type-D personality as independent variable was studied using multiple logistic regression adjusting for gender and age. Adjusted OR was 5.71 (CI 95%: 2.28-14.27). The probabilities of acute closure in the non-Type-D personality was 27% and in the Type-D personality was 70%.
Conclusions: Type-D personality was significantly related to acute primary angle closure independent of age and gender. The results of this study indicate that Type-D personality in an individual with occludable angles may be worth investigating as another risk factor for acute primary angle closure glaucoma.
References:
1. Ritch R, Shields MB, Krupin T. The Glaucomas. St. Louis. Mosby, 1989. Vol 2, Ch. 47, p.841. **2.** Denollet J. Type D personality. A potential risk factor refined. J Psychosom Res 2000; 49(4):255-66. **3.** Pedersen SS, Denollet J.Type D personality, cardiac events, and impaired quality of life: a review. Eur J Cardiovasc Prev Rehabil 2003;10(4):241-8. **4.** Denollet J, van Heck G. Psychological risk factors in heart disease: what Type D personality is (not) about. J Psychosom Res 2001;51(3):465-8. **5.** Denollet J. DS14: Standard assessment of negative affectivity, social inhibition, and Type D personality. Psychosom Med 2005;67(1):89-97.

P180 MANAGEMENT OF ACUTE ANGLE CLOSURE GLAUCOMA AT AN UK DISTRICT GENERAL HOSPITAL
D. Dey[1], G. Ghosh[2]
[1]North Tyneside Hospital, Nortyh Shields, United Kingdom, [2]Essex County Hospital, Lexden, Colchester, United Kingdom

Purpose: To analyse the management of acute angle closure glaucoma (AACG) at Essex County Hospital and compare it with published protocol
Design: Retrospective analysis of case notes of patients presenting with acute angle closure glaucoma at Essex County Hospital over a three year period.
Participants: Case notes of 16 patients presenting with acute angle closure glaucoma between January 2001 and May 2004 were looked at for this study. Sixteen eyes of 16 patients (10 female and 6 male) were diagnosed with primary acute angle closure glaucoma and was included for this study.
Intervention/Methods/Testing: All patients' profile, visual acuity, duration of symptoms, treatments were analysed to compare with the published protocol.
Main outcome measures: Patients' age, ethnicity, gender, laterality of eyes, presenting visual acuity& IOP treatment given response to the treatment & their visual acuity after the event were noted & compared with published protocol.
Results: The mean age was 64.5yrs (35-93). 10(62%) had right eye affected and the rest had Acute Glaucoma in their left eye. One patient was of South East Asian origin and the rest were

Caucasian (94%). Mean IOP at presentation was 49.5 mmHg. Mean duration of symptoms 2.3 days. Visual acuity was 6/60 or worse in 65% of the patients. Fourteen (87%) eyes received intensive Pilocarpine drops and 15 (94%) patients had oral and/or I.V. Acetazolamide as initial therapy after which the mean IOP dropped down to 35.1mmHg. Ten (62%) patients also received second line of antiglaucoma medications which included Timolo or Apraclodinine or Cosopt eye drops as needed. One patient needed I V Mannitol to control the IOP. The mean duration to achieve adequate IOP control was 4 hours & 94% of the patients achieved it without the use of osmotic diuretics. Further topical treatment was required in 29% of the patients for long term control of their IOP.All eyes underwent laser PI at later date, Final visual acuity was 6/24 or better in 10/17(58%) of the eyes. Of the seven patients who had a visual acuity less than 6/60 2 were amblyopic and one had a macular hole.
Conclusion: The study demonstrated that although no treatment protocol was followed at Essex County Hospital but results were comparable to published protocol/guideline.
References:
1. Eye 1999 13, June 613-616 Y.F Choong, S.Irfan, M.J.Menage –Acute Angle closure Glaucoma: an evaluation of a protocol for acute treatment **2.** Ritch R, Shields MB Krupin The Glaucomas, 2nd Edition, Vol 3 St. Louis Mosby Year book, 1996 1521 **3.** Saunders DC. Acute closed angle glaucoma and Nd YAG laser iridotomy . BrJ Ophthalmol 1990; 74:523 **4.** J Fr Ophthalmol .2004 Jun; 27 (6 Pt 2):701-5 Renard JP, Giraud JM, Oubaaz A

P181 ACUTE EPISODE IS ASSOCIATED WITH THE IRIS WITH LESS FLEXIBILITY – A HISTOLOGICAL STUDY OF THE IRIS IN THE DEVELOPMENT OF ANGLE CLOSURE IN CHINESE EYES
J. Xu, M. He, Y. Lu, Y. Zheng, X. Liu
Zhongshan Ophthalmic Center, Guangzhou, China

Introduction: It has been commonly accepted that narrowing of the drainage angle is the anatomical basis of primary angle closure (PAC). However, PAC acute episode only develops in small proportion of the patients with this anatomical characteristic. Histological characteristics of the iris may be important but has yet been investigated. Histological study in liver sclerosis suggests that the collagen type III is associated with the decreasing flexibility of the tissue.
Aims of study: To investigate the histological changes of the iris in the mechanism of angle closure.
Methods: Iris specimens were obtained by surgical iridectomy in a consecutive serial of patients diagnosed as acute (17 eyes), their fellow eyes (14 eyes), narrow angle suspects (11 eyes), chronic (19) angle closure, primary open angle glaucoma (7) and age-matched normal subjects (3) in the Zhongshan Ophthalmic Center, Guangzhou. Picric acid Sirius red (PASR) stain was used to quantified the amount of collagens and further to differentiate the type I and type III collagens by using polarized microscope.
Results: Compared to the eyes with early chronic PAC, POAG and normal controls, the total amount of collagen and proportion of type III collagens in the iris stroma consistently increased in the all fellow eyes and acute PAC eyes, similar increasing pattern was observed in 3/11 of narrow angle suspect eyes. The total amount of collagen decreased in chronic PAC, POAG eyes and was consistent with the staging of the diseases.
Conclusions: The iris flexibility decreases in the fellow eyes of acute episode. This characteristic appears to exist before and associate with the acute episode. Further work needs to prove this finding in animal models.
References:
1. Wyatt H, Ghosh J. Behaviour of an iris model and the pupil block hypothesis. Br.J.Ophthalmol. 1970;54:177-85 **2.** Sihota R, Saxena R, Agarwal HC. Entropion uveae: early sphincter atrophy, signposting primary angle closure glaucoma? Eur.J Ophthalmol. 2004;14:290-7. **3.** Junqueira LC, Cossermelli W, Brentani R. Differential staining of collagens type I, II and III by Sirius Red and polarization microscopy. Arch.Histol.Jpn. 1978;41:267-74. **4.** James J, Bosch KS, Aronson DC, Houtkooper JM. Sirius red histophotometry and spectrophotometry of sections in the assessment of the collagen content of liver tissue and its application in growing rat liver. Liver 1990;10:1-5.

P182 A COMPARISON OF THE EFFECTS OF INTRAVITREAL TRIAMCINOLONE ACETONIDE (IVTA) 4MG INJECTION VERSUS 8MG.
H.K. Kim
Kim's Eye Hospital, Konyang University, Seoul, South-Korea

Introduction: To evaluate IOP change due to triamcinolone concentration.
Aim of the study: To compare intraocular pressure after prior therapeutic IVTA 4mg and 8mg.
Object and method: This study was a retrospective, single center, randomized comparison of patients who were diagnosed in macular edema between March 2002 and June 2004. Our exclusion criteria were glaucoma patient before IVTA and repeated IVTA. The eyes divided into two groups. In A group, 50 eyes received an invtravitreal injection of 4mg of triamcinolone acetonide. In B group, 50 eyes received an intravitreal injection 8mg.
Result: Pre-injection average IOP in A group was 12±0.45 mmHg, 1 week after injection was 18±0.12 mmHg, and 1 month after injection was 17±0.24 mmHg. Pre-injection average IOP in B group 8mg was 13±0.23 mmHg, 1 week after injection was 20 ± 0.34 mmHg, and 1 month after injection was 18±0.56 mmHg. There were no difference in pre-injection baseline IOP and post injection in both of group A and group B (p-value>0.05). 9 of 100 patients (9%) experienced a pressure elevation to 24 mmHg or higher at a mean of 18 days. Pressure elevation was controlled with conservative treatment in all patients.
Conclusion: There is no statistical significance in pressure elevation after injection of triamcinolone 4mg and 8mg. And there is no uncontrolled complication. Further studies are necessary to measure accurate concentration of triamcinolone and to prevent of complication after high dose triamcinolone injection over 8mg .
Reference:
1. Jonas *et al.* AJO 2001;131:468-71. **2.** Martidis *et al.* Ophthalmology 2002;109:920-7.

P183 EFFECT OF INTRAVITREAL TRIAMCINOLONE ACETONIDE ON INTRAOCULAR PRESSURE
N. Simsek[1], E. Soykan[1], U. Elgin[1], S.S. Ozkan[1], A. Batman[2], O. Zilelioglu[1]
[1]Social Insurance Eye Hospital, Ankara, Turkey, [2]Social Insurance Eye Banking Hospital, Ankara, Turkey

Purpose: To investigate the incidence of intraocular pressure (IOP) elevation after intravitreal injection of triamcinolone acetonide.
Design: Prospective consecutive, non comparative interventional case series.
Participants: Fifty one eyes of 51 patients with diabetic macular edema (n=35 eyes), cystoid macular edema secondary Behcet's disease (7=eyes), central retinal vein occlusion (6=eyes), and age related macular degeneration (3=eyes) were enrolled in the study.
Methods: Triamcinolone acetonide at the dosage of 4mg/0.1 ml injected intravitreally through the inferior pars plana under topical anesthesia. A pressure elevation was defined as a pressure of 21mm Hg or higher during follow up.
Main outcome measures: The following clinical examinations were performed on each patient; visual acuity, IOP measurement, slit lamp biomicroscopy and dilated fundus examination. Examinations were repeated at 1, 2 weeks and then every month after the injection. Patients were followed up for a minimum three and maximum of 11 months (mean 4.11).
Results: There were 26 male (51%) and 25 female (49%) patients with a mean age of 53.19 years. The IOP of all patients was below 20 mmHg before the injection. An intraocular pressure elevation higher than 21 mmHg was observed in 35 of the 51 eyes (%68). Twenty-one of the 35 eyes (%41) demonstrated an increase in IOP of 5 mm Hg or higher, ten of the 35 eyes (%19,6) demonstrated an increase in IOP of 10 mm Hg or higher and four of the 35 eyes (%1,1) had an increase in IOP of 20 mm Hg or higher. Topical medication was started in 29 of 35 eyes (%83) and IOP normalized with topical medication in 25 of 29 (%86) eyes within three months. Penetrating glaucoma surgery was performed on three eyes with uncontrolled maximal medical treatment. Pseudohypopyon was observed in three eyes.
Conclusion: Despite the benefits of the intravitreal triamcinolone acetonide, it is associated with an elevation in IOP more than 21mm Hg in 35 of 51 eyes(%68) in our study. The occurrence of intractable glaucoma after the injection is a serious complication. Therefore a close monitoring of IOP is mandatory after intravitreal injection and this complication has to be weighed up the benefits of intravitreal injection of triamcinolone acetonide.
***References*:**
1. Smithen LM, Ober MD, Maranan l, Spaide RF. Intravitreal triamcinolone acetonide and intraocular pressure.Am J Ophthalmol 2004; 138:740-743. **2.** Jonas JB, Kreissing I, Degenring R. Intraocular pressure after intravitreal injection of triamcinolone acetonide. Br J Ophthalmol 2003; 87:24-27. **3.** Gillies MC, Simpson JM, Billson FA, Luo W, Penfold P, Chua W *et al.* Safety of an intravitreal injection of triamcinolone:results from a randomized clinical trial. Arch Ophthalmol 2004; 122:336-340. **4.** Kaushik S, Gupta V, Gupta A, Dogra MR,Singh R. Intractable glaucoma following intravitreal triamcinolone in central retinal vein occlusion. Am J Ophthalmol 2004; 137:758-760. **5.** Jonas JB, Kreissing I, Degenring R. Secondary chronic open angle glaucoma after intravitreal triamcinolone. Arch Ophthalmol 2003;121:729-730.

P185 PREVALENCE OF PSEUDOEXFOLIATION SYNDROME IN OPEN-ANGLE GLAUCOMA IN MOLDOVA
S.N. Gribonosov
Tiraspol Clinical Hospital, Tiraspol, Moldova

Objective: To estimate prevalence of pseudoexfoliation syndrome in open-angle glaucoma in Moldova.
Design: Prospective, cross-sectional, population-based study.
Participants and setting: 373 patients including 68 newly diagnosed were selected on the basis of study inclusion criteria from the entire cohort of 550 urban Caucasian glaucoma patients seen in Tiraspol Glaucoma Clinic through 2004. Inclusion criteria were defined as established diagnosis of high-tension open-angle glaucoma in at least one eye, satisfactory corneal transparency and no history of cataract surgery in both eyes.
Methods: Thorough bilateral non-dilated slit-lamp search for pseudoexfoliation deposits on corneal endothelium, aqueous humor, iris and anterior surface of lens.
Main outcome measures: Prevalence of pseudoexfoliation in high-tension open-angle glaucoma patients.
Results: Overall pseudoexfoliation was found in at least one eye of 236 patients out of 373 who met the study inclusion criteria and in 43 out of 68 newly diagnosed. Prevalence rate consisted 63.3% in the whole group and 63.2% in new referals subgroup and was practically identical (P=0.99). PEX was found in 125 out of 200 females (62.5%) and in 111 out of 173 males (64.2%). Difference was not significant (P=0.73). Although mean age of PEX patients was higher than non-PEX (70.4 *versus* 69.4 years) with more pronounced results in newly diagnosed subgroup (68.9 *versus* 66.1) the difference in mean age between PEX and non-PEX glaucoma patients did not meet the level of significance in the whole entire (P= 0.25) as well as in newly diagnosed subgroup (P=0.24).
Conclusions: Pseudoexfoliation syndrome has a very high rate and was found in about two-thirds in this Caucasian urban phacic high-tension open-angle glaucoma patients in Moldova as measured in non-dilated eyes. Prevalence of PEX was equal in newly diagnosed patients and in the whole group. Prevalence of PEX was not associated with gender. Mean age of PEX glaucoma did not differ significantly from non-PEX at the time of diagnosis and in entire cohort of these patients. These results partly contradict with some previous studies showing positive association of PEX with age. Further study comparing glaucoma and non-glaucoma individuals with PEX in this population is needed to reveal the nature of this contradiction.
References:
1. John G. Lindberg and the discovery of exfoliaton syndrome. Tarkkanen A; Kivela T Acta Ophthalmologica Scandinavica 2002; 80:151-154 **2.** Exfoliation syndrome**.** Ritch R; Schloetzer-Schrehardt U Survey of Ophthalmology 2001; 45:265-315 **3.** Pseudoexfoliation syndrome in Ethiopian glaucoma patients**.** Bedri A; Alemu И East African Medical Journal 1999; 76:278-280 **4.** Exfoliation glaucoma and primary open-angle glaucoma: associations with death causes and comorbidity**.** Ritland J S; Egge K; Lydersen S; Juul R; Semb S O
Acta Ophthalmologica Scandinavica 2004; 82:401-404 **5.** The prevalence of pseudoexfoliation syndrome in Chinese people**.** Young A L; Tang N W; Lam D S British Journal of Ophthalmology 2004; 88:193-195
6. Pseudoexfoliation in South India. Arvind *et al* British Journal of Ophthalmology 2003; 87:1321-1323

P186 CENTRAL CORNEAL THICKNESS IN PATIENTS WITH PSEUDOEXFOLIATION MATERIAL
S. Ugurlu, I. Cakir, G. Yildirim, N. Sefi Yurdakul, A. Maden
Izmir Ataturk Egitim Arastirma Hospital, Izmir, Turkey

Purpose: To evaluate central corneal thickness (CCT) in patients with pseudoexfoliation (PXE) material.
Methods: Consecutive patients attending outpatient clinic and Glaucoma Unit between March 2004-May 2004 with pseudoexfoliation material were included in the study. All patients were carefully examined to verify the presence of PXE material after pupillary dilation. Patients with typical optic nerve head changes or visual field defects characteristic for glaucomatous optic neuropathy were classified as PXE glaucoma; those without glaucomatous optic neuropathy were grouped as PXE syndrome. Patients with prior intraocular surgery, dry eye syndrome, and coexistent ectatic corneal degenerations were excluded from the study. CCT was measured with Optikon 2000 Pacline pachymeter by a single operator using averaging mode. Three consecutive measurements were used to calculate the average CCT. The results were compared to an age and sex-matched control group.
Results: Average age of patients with PXE glaucoma (n=18), PXE syndrome (n=14) and the control group (n=40) were 68.7±7.1, 72.1±5.7, and 71.1±6.2 years, respectively. Average mean defect, short fluctuation and corrected pattern standard deviation were –15.1±3.9, 2.48±1.2 and 5.15±1.0 in patients with PXE glaucoma, respectively. CCT was significantly lower in the PXE glaucoma patients (532.2±40.3 microns) than PXE syndrome patients (544.5±22.5 microns; p=0.039) and the controls (551.5 ±33.3 microns; p=0.046). There was no statistically significant difference between the controls and the patients with PXE syndrome.
Conclusion: Patients diagnosed with PXE glaucoma have significantly lower CCT measurements than patients with PXE syndrome and normal individuals. These findings suggest that patients with PXE material and thinner corneas are more likely to develop glaucomatous functional damage, and that CCT measurements should be taken into account when assessing risk for the development of glaucoma among subjects with PXE syndrome.
References:
1. Aghaian E, Choe JE, Lin S, Stamper RL.Central corneal thickness of Caucasians, Chinese, Hispanics, Filipinos, African Americans, and Japanese in a glaucoma clinic. Ophthalmology 2004;111(12):2211-9. **2.** Inoue K, Okugawa K, Oshika T, Amano S. Morphological study of corneal

endothelium and corneal thickness in pseudoexfoliation syndrome.Jpn J Ophthalmol. 2003;47(3): 235-9. **3.** Ventura AC, Bohnke M, Mojon DS. Central corneal thickness measurements in patients with normal tension glaucoma,primary open angle glaucoma, pseudoexfoliation glaucoma, or ocular hypertension. Br J Ophthalmol. 2001;85(7):792-5. **4.** Bechmann M, Thiel MJ, Roesen B, Ullrich S, Ulbig MW, Ludwig K. Central corneal thickness determined with optical coherence tomography in various types of glaucoma. Br J Ophthalmol. 2000;84(11):1233-7.

P187 PLASMA LEVELS OF L-ARGININE, ASYMMETRIC AND SYMMETRIC DIMETHYLARGININE IN EXFOLIATION SYDROME AND GLAUCOMA

H.T. Blomster[1], T. Puustjärvi[2], M. Kontkanen[3], M. Teräsvirta[2], K. Punnonen[2], H. Uusitalo[2]
[1]Institution of Deacony, Lahti, Finland, [2]Kuopio University Hospital, Kuopio, Finland, [3]North Karelia Central Hospital, Joensuu, Finland

Exfoliation syndrome (XFS) is a systemic disorder with intra-, peri- and extraocular diseases, e.g. exfoliation glaucoma (XFG), xerophtalmia, cardio- and cerebrovascular diseases. Hyperhomocysteinemia and oxidative stress are implicated in the pathogenesis of XFS. Both of them may cause vascular dysregulation with impaired blood flow. We aimed to study, if asymmetric dimethylarginine (ADMA), an endogenous inhibitor of nitric oxide, often increased in hyperhomocysteinemia, might be elevated in XFS/XFG. A cross-sectional study with 36 XFS patients, 11 of them having XFG, and 36 age-and gender matched controls attending for routine cataract extraction were performed. Fasting plasma samples of ADMA, symmetric dimethylarginine (SDMA) and L-arginine were collected preoperatively and measured with high-performance liquid chromatography.
The means of ADMA, SDMA and L-arginine levels had no significant statistical correlation (Mann-Whitney U, Wilcoxon W) between XFS, XFG and control patients. The plasma levels of ADMA, SDMA and L-arginine show no statistical differences between XFS, XFG and control groups. In our currently published study plasma homocysteine (P-Hcy) levels were higher in the XFS/XFG group compared to controls. We used also the same patient groups for plasma analyses of ADMA, SDMA and L-arginine. Interestingly, there was a significantly positive correlation between P-Hcy and SDMA both in the control group (P=0.000) and in the XFG subgroup (P= 0.002), but not in the XFS subgroup (P=0.188).
References:
1. Sydow K, Münzel T. ADMA and oxidative stress. Atherosclerosis supplements. 2003;4:41-51. **2.** Tran CTL, Leiper JM, Vallance P.The DDAH/ADMA/NOS pathway. Atherosclerosis supplements. 2003;4:33-40. **3.** Selley ML. Increased concentrations of homocysteine and asymmetric dimethylarginine and decreased concentrations of nitric oxide in the plasma of patients with Alzheimer's disease. Neurobiology of aging. 2003;24:903-907. **4.** Teerlink T, Nijveldt RJ, de Jong S *et al.* Analytical Biochemistry. 2002;303:131-137. **5.** Puustjärvi T, Blomster H, Kontkanen M *et al.* Plasma and aqueous humour levels of homocysteine in exfoliation syndrome. Graefe's Arch Clin Exp Ophthalmol. 2004,242;749-754.

P188 CIRCULATING PLATELET AGGREGATES IN PSEUDOEXFOLIATION GLAUCOMA

BL Bojic[1], V Rogosic[1], M Ivanisevic[1], Z Mandic[2]
[1]Clinical Hospital Split, Split, Croatia, [2]Clinical Hospital Zagreb, Zagreb, Croatia

Introduction: A recent evidence suggest for an association of pseudoexfoliation (PEX) and vascular disease[1-3].
Aim of the study: To to assess a role of circulating platelet aggregates (CPA) in patients with pseudoexfoliation glaucoma. A case-controlled study.
Methods: CPA was determined in 25 patients with PEX glaucoma aged 67 ± 6.1 years and 20 normal controls aged 64.5 ± 3.9 years. The ratio of CPA was investigated according to the platelet function system described by Wu and Hoak and modified by Kiesewetter *et al* [4-5]. The test for circulating aggregates was based on the effect of ethylendiaminetetraacetic acid (EDTA) and formalin on platelet aggregates occurring *in vivo* or resulting from blood sampling. These aggregates were broken up by EDTA, but immediately fixed with EDTA + formalin. Blood samples were obtained using a two-syringe technique. Each 0.5 ml blood sample was added to 2 ml buffered EDTA or to 2 ml buffered EDTA + formalin. The blood picture was determined in each sample. The results were expressed as a ratio of the platelet count in the buffered EDTA solution divided by the platelet count in the buffered EDTA + formalin solution.
Results: The level of CPA was significantly higher in patients with PEX glaucoma (1.28±0.45 *versus* 0.97±0.19; p= 0.001). No significant gender-based differences in platelet aggregability were found.
Conclusion: Our study showed increased platelet aggregability in patients with PEX glaucoma.
References:
1. Repo LP, Terasvirta ME, Koivisto KJ (1993) Generalized transluminance of the iris and the frequency of pseudoexfoliation syndrome in the eyes of transient ischemic attack patients. Ophthalmology 100:353-355 **2.** Repo LP, Suhonen MT, Terasvirta ME, Koivisto KJ (1995) Color Doppler imaging of the ophthalmic artery blood flow spectra of patients who have had a transient ischemic attack. Ophthalmology 102:1199-1205 **3.** Mitchell P, Wang JJ, Smith W (1997) Association of pseudoexfoliation syndrome with increased vascular risk. Am J Ophthalmol 124:685-687 **4.** Wu KK, Hoak JC.A new method for the quantitative detection of platelets aggregates in patients with arterial insufficiency. Lancet 1974;II:924-6. **5.** Keiserwetter H, Jung EM, Mrowietz C, Koscienly J, Wenzel E. Effect of garlic on platelet aggregation in patients with increased risk of juvenile ischemic attack. Eur J Clin Pharmacol 1993;45:333-6.

P189 COMPLEMENT ACTIVATION IN EXFOLIATION SYNDROME (XFS)

R. Ritch[1], B. Ovedenkol[1], A. Rostagno[2], J.M Liebmann[2], J.A. Ghiso[2]
[1]The New York Eye and Ear infirmary, New York, NY, United States of America, [2]University School of Medicine, New York, NY, United States of America

Methods: Anterior lens capsules from patients with and without XFS were divided into two groups, homogenized in formic acid, and subjected to protein fragmentation with cyanogen bromide (CNBr). Aliquots of resultant peptides were separated on gradient SDS-PAGE and visualized with silver stain. Bands that were differentially stained were excised from the gel, digested with trypsin, and sequenced using Quadrupole Time-of-Flight mass spectrometry (Q-TOF MS). The resultant deconvoluted MS/MS spectra were directly used to search in batch, the NCBI non-redundant protein database using the Mascot search program (Matrix Science, UK). The remainder of CNBr-fragmented material was digested with either trypsin or elastase and analyzed with liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS). The resultant MS/MS spectra were analyzed by Bioworks 3.1 (Thermo Finnigan, USA) utilizing the SEQUEST database. Immunohistochemical analysis for the components of the complement pathways was performed in XFS *vs.* control samples using conventional horseradish peroxidase-based immunohistochemistry.
Results: Both biochemical approaches yielded similar results. Specifically, components involved in inhibition of complement activation (*e.g.*, clusterin and vitronectin) were identified. Immunohistochemistry revealed very strong staining of XFM with anti-clusterin antibody and moderate staining with antibodies against normal components and activation products of the classical complement pathway: C1q, C3c, and C4c. In the samples examined, there was no staining of XFM with anti-apolipoprotein-E, anti-Bb, and anti-C5b-9 antibodies.
Conclusions: Deposition of normal components and activation products of the classical complement pathway in XFM could be due to ocular ischemia and/or inflammatory process. Clusterin, a ubiquitous extracellular protein, is found in a wide variety of lesions and has multiple functions, such as protection against apoptosis and oxidative stress, inhibition of the membrane attack complex of complement proteins, and inhibition of amyloid aggregation. The apparently great abundance of clusterin in XFM, along with the presence of complement activation products is intriguing and warrants further study. Complement inhibition should be investigated as a potential therapy for mitigating cytotoxicity in the anterior segment in XFS.
References:
1. Ritch R, Schlötzer-Schrehardt UM. Exfoliation syndrome. Surv of Ophthalmol. 2001;45(4):265-315. **2.** Jones SE, Jomary C. Molecules in Focus: Clusterin. Int J Biochem & Cell Bio. 2002;34: 427-31 **3.** Calero M, Rostagno A, Matsubara E, Zlokovic B, Frangione B, Ghiso J. Apolipoprotein J (Clusterin) and Alzheimer's Disease. Microsc. Res. Tech. 2000;50:305-315. **4.** Nishida K, Quantock AJ, Dota A, Choi-Miura NH, Kinoshita S. Apolipoproteins J and E co-localize with amyloid in gelatinous drop-like and lattice type I corneal dystrophies. Br J Ophthalmol. 1999;83: 1178-82. **5.** Johnson LV, Leitner WP, Staples MK, Anderson DH. Complement activation and inflammatory processes in drusen formation and age related macular degeneration. Exp Eye Res. 2001 Dec;73(6):887-96.

P190 THE EFFECT OF POSTERIOR SUBTENON INJECTION OF CORTICOSTEROIDS ON INTRAOCULAR PRESSURE IN CASES WITH CHRONIC UVEITIS

K.U. Elgin, A. Batman, T. Simsek, P. Ozdal, N. Berker
Social Insurance Eye Banking Hospital, Ankara, Turkey

Introduction: Posterior subtenon injection of corticosteroids have been used for cystoid macular oedema and other posterior segment inflammatory changes in the cases with uveitis.
Aim: To investigate the effect of posterior subtenon injection of corticosteroids on intraocular pressure (IOP) in the cases with chronic uveitis in three-months period.
Methods: Twenty four eyes of 21 cases with chronic uveitis (9 male, 12 female; mean age±SD: 32 ± 11.5 years) were included to our prospective study. In 11 eyes (45.8%) Behçet's disease, in six6 eyes (25%) intermediate uveitis, in five eyes (20.8%) chronic idiopathic uveitis, in one eye (4.2%) pars planitis and in one eye (4.2%) chronic idiopathic uveitis with vasculitis had been diagnosed. All the cases had received topical or systemic corticosteroids before, but no rise in IOP had been noted. The IOP?s were measured before and after the posterior subtenon injections (at the first and third month after the treatment) and statistical analysis was done with paired *t* test.
Results: The mean IOP before the injection was 11.2 ± 3.07mmHg (7-17mmHg), while it was 16.5 ± 9.9mmHg (6-46mmHg) at the first month and 13.04 ± 5.6mmHg (7-30mmHg) at the third month after the injection. In eight eyes (33.3%), an increase of minimum 5 mmHg in IOP was detected at the first month. The differences between the IOP measurements at the baseline and at the first and third month after the injections were found to be statistically significant (P=0.000). In two eyes topical anti-glaucomatous agents were used while in three eyes trabeculectomies with mitomycin-C were performed to control the IOP.
Conclusions: The posterior subtenon injection of corticosteroids can cause transient or chronic increase in IOP in the cases with chronic uveitis.
References:
1. Lightman S. Use of steroids and immunosuppressive drugs in the management of posterior uveitis. Eye 1991;5:294-298. **2.** Okada AA, Wakabayashi T, *et al.* Trans-Tenon's retrobulbar triamcinolone infusion for the treatment of uveitis. Br J Ophthalmol 2003;87:968-971. **3.** Helm CJ, Holland GN. The effects of posterior subtenon injection of triamcinolone acetonide in patients with intermediate uveitis. Am J Ophthalmol 1995;120:55-64. **4.** Yoshikawa K, Kotake S, *et al.* Posterior sub-Tenon injections of repository corticosteroids in uveitis patients with cystoid macular edema. J J Ophthalmol 1995;39:71-76. **5.** Tanner V, Kanski JJ, *et al.* Posterior sub-Tenon?s triamcinolone injections in the treatment of uveitis. Eye 1998;12:579-685. **6.** Dafflon ML, Tran VT, *et al.* Posterior sub-Tenon's steroid injections for the treatment of posterior ocular inflammation: indications, efficacy and side effects. Graefe's Arch Exp Ophthalmol 1999;237:289-295. **7.** Mueller AJ, Jian G, *et al.* The effect of deep posterior subtenon injection of corticosteroids on intraocular pressure. Am J Ophthalmol 1998;125:158-163. **8.** Thach AB, Dugel PU, *et al.* A comparison of retrobulbar *versus* sub-Tenon's corticosteroid therapy for cystoid macular edema refractory to topical medications. Ophthalmology 1997;104:2003-2008. **9.** Antcliff RJ, Spalton DJ, *et al.* Intravitreal triamcinolon for uveitic cystoid macular edema: An optical cohorence tomography study. Ophthalmology 2001;108:765-772.

P191 ANGLE RECESSION A PERMANENET SEQUEL OF CHARSHANBESOORI FIREWORKS INJURIES

E. Hatef Naimi, F. Rahimi, S.F. Mohammadi, M.N. Hashemian, H. Rahbari
Eye Research Center, Farabi Eye Hospital, Tehran, Iran

Purpose: To evaluate the frequency and extent of angle recession in hyphema following blunt fireworks eye injuries.
Design: Case series.
Participants: Twenty-six patients with unilateral hyphema due to Iranian fireworks (Charshanbe-Soori), 4-6 weeks following injury.
Methods: Two examiners independently performed gonioscopy on both eyes of the participants.
Main outcome measures: The frequency and extent of angle recession.
Results: The age range was 7-50 (median: 18) years. Twenty-one (81%) of the cases were male. The left eye was involved in twenty (77%) of the cases. The proportion of gross to microscopic hyphema was 1:1. Sixteen cases (58%) had angle recession with a mean extension of 6 clock hours (ranged from 45 to 360 degrees). The entire firework agents-related recessions were caused by 'Narenjak' a home-made explosive device (P value: 0.012). Recession was predictable through a model (R-square: 0.607, P value: 0.003): young adult age group, male gender, use of Narenjak, history of happening to be closer to the explosion focus, and a more severe hyphema were the associations. (P values were respectively 0.098, 0.096, 0.051, 0.009, and 0.014).
Conclusion: Angle recession proved to be very common and extensive among the patients with hyphema injured in Charshanbe-Soori fireworks. The modifiable risk factors were the distance from the focus of explosion and the type of the firework used. Severity of the associated hyphema can alert the clinician for the presence of recession.
References:
1. Capao Filipe JA, Fernandes VL, Barros H, Falcao-Reis F, Castro-Correia J. Soccer-related ocular injuries. Arch Ophthalmol 2003 May;121(5):687-694. **2.** Filipe JA, Barros H, Castro-Correia J. Sports-related ocular injuries. A three-year follow-up study. Ophthalmology 1997 Feb; 104(2):313-318. **3.** Salmon JF, Mermoud A, Ivey A, Swanevelder SA, Hoffman M. The detection of post-traumatic angle recession by gonioscopy in a population–based glaucoma survey. Ophthalmology 1994 Nov;101(11):1844-1850. **4.** Driver PJ, Cashwell LF, Yeatts RP. Airbag-associated bilateral hyphemas and angle recession. Am J Ophthalmol 1994 Aug 15;118(2):250-251. **5.** Burke MJ, Sanitato JJ, Vinger PF, Raymond LA, Kulwin DR. Soccerball-induced eye injuries. JAMA 1983 May 20;249(19):2682-2685.

P192 PREVALENCE OF GLAUCOMA IN PATIENTS OF CARDIOVASCULAR DISEASES – A PRELIMINARY REPORT

C.-Y. H. Hu, S.C. Chang-sik, K.-C. Chen, K.-M.C. Chiu, C.-Y.Y. Yang, S.-S.C. Chu
Far Eastern Memorial Hospital, Taipei, Taiwan

Purpose: Since inadequate ocular perfusion is a risk factor of glaucoma, we intended to determine whether a higher prevalence of glaucoma would exist in cardiovascular patients.
Methods: We randomly enrolled 51 patients in the Cardiovascular Center of Far Eastern Memorial Hospital. After well informed of the study procedures and signing the consent, they underwent frequency-doubling perimetry (FDP) examination (24-2 screening test, Humphrey

Matrix, Carl Zeiss Meditec, Oberkochen, Germany). Then, our glaucoma specialist examined their optic discs. Patients with any abnormal FDP result or optic disc abnormality underwent a second-session, more detailed FDP test (30-2 full threshold test) later. If the result was still abnormal, they would have a conventional Humphrey field analyzing (HFA) examination (30-2 SITA standard test, HFA IIi, Carl Zeiss Meditec, Oberkochen, Germany) after a few days. The criteria of glaucoma included glaucomatous optic disc change and corresponding FDP or HFA defect. When only either one existed, we classified the eye as glaucoma suspect.
Results: The age of these 18 men and 33 women was 61 ± 11 years. They were 20 hypertensive patients, 14 arrhythmic patients and 16 patients of both diseases. Except for 1 amblyopic right eye and one left eye with macular hole, 100 eyes were included for further analysis. In the first FDP session, the test time, fixation loss rate and false positive rate were similar between the right and left eyes (P>0.05, paired t-test). The mean test time was two minutes. Sixteen eyes (16%) failed due to high fixation loss. Fifty-three eyes had at least one abnormal area, and 50 eyes of them finished the second-session FDP test in 6.5 minutes on average. Excluding one eye (2%) with high fixation loss, their MD and PSD were -6.46 ± 4.83 dB and 3.84 ± 1.13 dB, respectively. Twelve eyes (24%) had normal MD and PSD, which were false positive of 24-2 screening test. Thirty-three eyes with abnormal FDP 30-2 threshold test completed HFA examination in 8.4 minutes on average. Fifteen eyes (45%) were excluded because of high fixation loss. Their MD and PSD were -3.98 ± 3.12 dB and 4.22 ± 2.45 dB, respectively. We found six eyes (6%) of glaucoma, including three eyes diagnosed before, and seven eyes (7%) of glaucoma suspect.
Conclusions: The prevalence of glaucoma in cardiovascular patients is high; however, further comparison with the age-matched general population is required to determine the relative risk. The new FDP test is much more applicable to the senile cardiovascular patients than HFA test which took longer time and generated more fixation loss.
References:
1. Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714-20. **2.** Tatemichi M, Nakano T, Tanaka K, *et al.* Performance of glaucoma mass screening with only a visual field test using frequency-doubling technology perimetry. Am J Ophthalmol 2002; 134:529-37. **3.** Cello KE, Nelson-Quigg JM, Johnson CA. Frequency doubling technology perimetry for detection of glaucomatous visual field loss. Am J Ophthalmol 2000;129:314-22. **4.** Yamazaki Y, Hayamizu F, Miyamoto S, Nakagami T, Tanaka C, Inui S. Optic disc findings in normal tension glaucoma. Jpn J Ophthalmol 1997;41:260-7. **5.** Nicolela MT, Drance SM. Various glaucomatous optic nerve appearances: clinical correlations. Ophthalmology 1996;103:640-9. **6.** Congdon NG, Quigley HA, Hung PT, Wang TH, Ho TC, Glovinsky Y. Impact of age, various forms of cataract, and visual acuity on whole-field scotopic sensitivity screening for glaucoma in rural Taiwan. Arch Ophthalmol 1995;113:1138-43.

10. DIFFERENTIAL DIAGNOSIS

P193 OPTIC DISC APPEARANCE AND VISUAL FIELD LOSS AT TIME OF DIAGNOSIS IN PATIENTS WITH OPTIC DISC DRUSEN AND TIME DYNAMIC OF VISUAL FIELD PROGRESSION COMPARED TO PATIENTS WITH NORMAL TENSION GLAUCOMA

M. Schargus[1], G. Gramer[2], E. Gramer[2]
[1]University Eye Hospital Würzburg, Würzburg, Germany, [2]Augenklinik Universität Würzburg, Würzburg, Germany

Purpose: If optic disc drusen (ODD) are associated with glaucoma it might be helpful to know more about the natural cause of optic disc changes and visual field progression (VFP) in patients with ODD. Therefore we investigated: I. the time dynamic of VFP in patients with ODD compared to patients with normal tension glaucoma (NTG) calculated from the mean age of the patients at the time of diagnosis in patients groups with different stages of VFL. II. whether the extend of visibility of ODD and stage of VFL increases with increasing age of the patient at the time of diagnosis.
Design: Retrospective case controlled study
Participants: Seventy seven patients with ODD which met the inclusion criteria: ultrasonographic confirmed ODD, reliable visual field findings, no other disease which can cause a VFL. Seventy five patients (144 eyes) with ODD had photodocumentation of the optic disc at time of diagnosis. For comparison of the time dynamic of VFL 115 patients with NTG were investigated.
Methods: VFL at time of diagnosis was staged in ODD and NTG patients. According to the eye with the more severe VFL we categorised for both diseases 3 groups: no VFL, VFL stage I/II, (classification of Aulhorn), VFL stage III/IV. Visibility of ODD at time of diagnosis was categorized into three groups: burried drusen, visible drusen grade 1, 2. Spearman-Rho test was used for statistics.
Main outcome measures: I. Time difference between the mean age of the patients at diagnosis for groups of patients with different stages of VFL for NTG or ODD. This provides indirect information on the time dynamic of VFP. II. The optic disc appearance and visibility of ODD in relation to the stage of VFL at the time of diagnosis.
Results: I. At the onset of the disease ODD patients show a faster initial VFP than NTG patients. ODD: The time difference between the mean age at diagnosis in 28 patients with no VFL and 32 patients with VFL stage I/II was 6.8 years (34,8 *vs* 41,6 years) NTG: The time difference between the mean age at diagnosis in 35 patients with preperimetric NTG and 45 patients with VFL stage I/II was 8,3 years (50,2 *vs* 58,4 years).
II. With increasing age at time of diagnosis there was a significant increasing visibility of ODD ($p<0,01$) and a significant increase in stage of VFL ($p<0,01$).
Conclusion: Patients with ODD have a faster initial VFP than patients with NTG. The older the patient at time of diagnosis, the higher the visibility of ODD and the more severe the stage of VFL. It is not possible to differentiate the cause of VFP in patients with ODD associated with glaucoma. A VFP in glaucoma patients presenting an increasing visibility of ODD can be caused by ODD oneself and should not necessarily be interpreted as sign of an inappropriate glaucoma treatment. Age is a risk factor for VFP in both diseases.
References:
1. Tello C. *et al.* Optic Nerve Head Drusen and visual field loss in normotensive and hypertensive eyes, e-abstract ARVO2005

11. MEDICAL TREATMENT

P194 PATIENT-REPORTED PROBLEMS IN USING GLAUCOMA MEDICATIONS AND ADHERENCE TO THERAPY

A.L. Robin[1], B. Sleath[2], D. Covert[3], J. Byrd[4]
[1]Johns Hopkins University, Baltimore , MD, United States of America, [2]Univeristy of North Carolina, Chapel Hill, NC, United States of America, [3]Alcon Laboratories, Fort Worth, TX, United States of America, [4]University of North Carolina, Chapel Hill, NC, United States of America

Introduction and aim of study: We investigated self-reported adherence by assessing patient reported problems in using intraocular pressure lowering medications for glaucoma.
Methods: Patients on two or more glaucoma medications in three different practices completed a self-administered survey regarding problems or concerns with their glaucoma medications in 13 different areas. We assessed patient adherence to glaucoma medications during the past week using the Brief Medication Questionnaire (BMQ). We calculated an average percent adherence to glaucoma medications. We dichotomized adherence into those patients who reported being 100 percent adherent and those who were less adherent.
Results: 296 patients participated. 46% were White and 39% were African American. 47% were female. Patient age ranged from 20 to 95 years (mean=68, SD=13). 75% had prescription drug insurance. Patients reported paying between 0 and $356 dollars per month out-of-pocket for their glaucoma medications (mean=$41.34, SD=$50.91). 76% used two glaucoma medications, 19% used three, and 5% used four or more. Patients reported an average of 2.54 problems (SD=2.39) using their glaucoma medications (range 0-11). The most frequent problems included: (a) drop administration (59%), (b) difficulty paying for medications (44%), (c) hard to read the print on the container (17%), (d) side effects (15%), and (d) difficulty remembering to take the medications (11%). Less education was related to difficulty paying for medications (*t*-test=-2.24, p=0.026). Older patients reported more problems opening bottles (*t*-test=3.11, p=0.004). Patients on more glaucoma medications were significantly more likely to report difficulties with remembering to take their medications (Pearson chi-square=10.833, p=0.004), getting their refills on time (Pearson chi-square=7.94, p=0.029), squeezing the bottle (Pearson chi-square=6.91, p=0.03), getting the seal off (Pearson chi-square=13.92, p=0.001), and opening the container (Pearson chi-square=15.38, p=0.000). Fourteen percent of patients reported not taking all prescribed doses of their glaucoma medications during the past week. None of the patient demographics were significantly related to non-adherence. Some factors significantly associated with patient non-adherence: having difficulty squeezing the bottle (Fisher's exact test, p=0.009) and having trouble remembering to take the medications (Fisher's exact test, p=0.02). Finally, it is important to note that nearly one-fourth of the patients waited less than three minutes when instilling multiple glaucoma medications and waiting more than three minutes was positively associated with increasing education (*t*-test= 2.37, p=0.019). ***Conclusion***: Non-adherence to glaucoma medical therapy is a significant problem with patients and this was consistent across the three practices surveyed.
References:
1. http://glaucoma.org/learn/facts.html **2.** Meichenbaum D, Turk DC. Facilitating Treatment Adherence: a Practitioner's Guidebook. New York, Plenum Press, 1987. **3.** Kass MA, Mektzer DW, Gordon M, *et al.* Compliance with Topical Pilocarpine Treatment. Am J Ophthalmol 1986;101:515-523. **4.** Kass MA, Gordon M, Morley RE, *et al.* Compliance with Topical Timolol Treatment. Am J Ophthalmol 1987;103:188-193. **5.** Gurwitz JH, Glynn RJ, Monane M, *et al.* Treatment for Glaucoma: Adherence by the Elderly. Am J Pub Health 1993;83(5):711-716. **6.** Taylor SA, Galbraith SM, Mills RP. Causes of Non-Compliance with Drug Regimens in Glaucoma Patients: a Qualitative Study. J Ocular Pharm & Therap 2002;18(5):401-409. **7.** Winfield AJ, Jessiman D, Williams A, *et al.* A Study of the Causes of Non-Compliance by Patients Prescribed Eye Drops. Br J Ophthalmol 1990;74:477-480. **8.** Svarstad B, Chewning B, Sleath B, *et al.* The Brief Medication Questionnaire: a Tool for Screening Patient Adherence and Barriers to Adherence. Patient Educ Couns 1999;37:113-124. **9.** Serle J, Toor A, Fahim M, *et al.* The Effect of Varying Dosing Intervals on the Efficacy of Intraocular Pressure Lowering Drugs. Invest. Ophthalmol Vis Sci 2004; 45:ARVO e-abstract 974. **10.** Haynes RB, McDonald HP, Garg AX. Helping Patients Follow Prescribed Treatment. JAMA 2002;288(22):2880-2883. **11.** Roter DL. Effectiveness of Interventions to Improve Patient Compliance. Med Care 1998;36(8):1138-61. **12.** Cramer JA. Enhancing Patient Compliance in the Elderly. Drugs Aging 1998;12(1):7-15. **13.** DiMatteo MR. Variations in Patients? Adherence to Medical Recommendations: a Quantitative Review of 50 years of Research. Med Care 2004;42:200-209.

P195 THE ROLE OF DEPRESSION AND PERSONALITY CHARACTERISTICS IN THE COMPLIANCE OF GLAUCOMA PATIENTS

Ch. Pappa, Ch. Pappa, S. Pappa, T. Hyphantis, M. Aspiotis, M. Stefaniotou, G. Kitsos, V. Mavreas, K. Psilas
University, Ioannina, Greece

Introduction: Non-compliance has proven to be an important factor in the effective management of glaucoma. Treatment may involve the use of multiple lifelong medications and despite therapy progressive visual impairment can in many cases not be avoided. Although a number of studies have been performed to investigate the rate and common factors that interfere with non-compliance, none of them addresses systematically the relationship between psychopathology, personality characteristics, and non-compliance in glaucoma.
Purpose: To assess the impact of psychopathological and personality characteristics in the compliance of patients with primary open-angle glaucoma.
Methods: A prospective cross-sectional study was conducted with 100 patients with open angle glaucoma. The study population was recruited from the university glaucoma clinical practice. All patients were ascertained by means of a predetermined questionnaire concerning compliance, demographic characteristics and severity of the disease. The following questionnaires were also administered: The General Health Questionnaire (GHQ-28), the Symptom Checklist-90-R (SCL-90-R), the Center for Epidemiological Studies-Depression Scale (CES-D), the Hostility and Direction of Hostility Questionnaire (HDHQ), the Defense Style Questionnaire (DSQ) and the Brief WHO Quality of Life Questionnaire. Statistical analysis was carried out using Kendall's tau-b procedure followed by Multiple Logistic Regression Analysis with compliance to treatment as dependent variable.
Results: Non-compliant patients with glaucoma presented significantly higher depression, anxiety and psychoticism scores in comparison to the compliant patients. In addition, patients that adopted a 'Maladaptive Defensive Style' a style that includes most of the immature ego mechanisms of defence (projection, acting out, regression, autistic fantasy, projective identification, passive aggression and splitting) presented lower rates of compliance. The severity of the disease also correlated strongly with non-compliance, whereas educational level and SCL-90's 'obsessiveness-compulsiveness' scores were positively predictors for compliance. These results were independent to age, sex and family status (Table 1).
Conclusions: The occurrence of depression, anxiety and maladaptive personality characteristics seem to affect considerably the compliance of patients with primary open angle glaucoma. These findings may be especially helpful as they implicate ways to intervene and improve compliance in glaucoma patients.
References:
1. Ashburn F, Goldberg I, Kass M. Compliance with ocular therapy. Surv Ophthalmol Suppl 1980;24:237-46 **2.** Zimmermann T, Zalta A. Facilitating patient compliance in glaucoma therapy. Surv Ophthalmol Suppl 1983;28:252-7 **3.** Konstas AGP, Maskarelis G, Gratsonidis S, *et al.* Compliance and viewpoint of glaucoma patients in Greece. Eye 2000;14:752-756. **4.** Vaillant GE. Ego mechanisms of defense. A guide for clinicians and researchers. American Psychiatric Press, 1992. **5.** Bond M, Gardner ST, Christian J, *et al.* Empirical study of self-rated defense styles. Arch Gen Psychiatry 1983;40:333-8. **6.** Hyphantis T, Kaltsouda A, Triantafillidis J, *et al.* Personality correlates of adherence to type 2 diabetes regimens. Int J Psychiatry in Medicine, in press.

P196 TFF1, MUC5AC AND HLA-DR EXPRESSION BY CONJUNCTIVAL CELLS IN CHRONICALLY TREATED GLAUCOMATOUS PATIENTS. COULD THESE MARKERS PREDICT THE SUCCESS OF ANTIGLAUCOMATOUS SURGERY?

A.M. Bron[1], N. Buron[2], P.O. Lafontaine[1], M. Souchier[1], S. Arnavielle[1], E. Solary[2], F. Brignolle[3], C. Baudouin[4], C. Creuzot-Garcher[1]
[1]University Hospital, Dijon, France, [2]Unité INSERM, Dijon, France, [3]CHNO 15/20, Paris, France, [4]CNHO 15/20, Paris, France

Purpose: Conjunctival inflammation may impair the outcome of glaucoma surgery and topical antiglaucomatous treatment could lead to conjunctival inflammation. TFF1 are secretory products of mucous epithelial cells which have protective and healing properties in mucosal tissues. They are co-expressed and act in concert with MUC5AC. HLA-DR expression is a marker of local inflammation. Our aim was to assess conjunctival expression of HLA-DR, TFF1 and MUC5AC in chronically treated glaucomatous patients and to see whether these parameters could predict the outcome of glaucoma surgery.
Subjects and methods: We performed 77 conjunctival impressions cytologies in glaucomatous patients (66 receiving drops with preservative, 11 preservative free) and in 43 controls. TFF1, MUC5AC and HLA-DR expression were analyzed by flow cytometry. Trabeculectomy or deep-sclerectomy were performed one day after the impression cytology in 56 patients; success was defined as an IOP<15 mm Hg without any lowering IOP drug at three months.
Results: The expression of TFF1, MUC5AC and HLA-DR expression was statistically higher in chronically treated patients *vs* controls (p=0.01, 0.05, 0.004 respectively). A higher expression of MUC5AC was found in patients having treatment with preservative *vs* non preserved drops (p=0.04). Successful glaucoma surgeries had a higher MUC5AC and lower HLA-DR expression *vs* failure surgeries.
Discussion: TFF1 and MUC5AC secretion is probably a response to surface ocular alterations due to a long term topical treatment. Their increased expression could be a predicting factor of a successful antiglaucomatous surgery.
References:
1. Broadway DC, Grierson I, O'Brien C, Hitchings RA. Adverse effects of topical antiglaucoma medication. II. The outcome of filtration surgery. Arch Ophthalmol. 1994; 112: 1446-54. **2.** Baudouin C, Garcher C, Haouat N, Bron AM, Gastaud P. Expression of inflammatory membrane markers by conjunctiva cells in chronically treated patients with glaucoma. Ophthalmology. 1994; 101: 454-60. **3.** Kindon H, Pothoulakis C, Thim L, Lynch-Devaney K, Podolsky DK. Trefoil peptide protection of intestinal epithelial barrier function: cooperative interaction with mucin glycoprotein. Gastroenterology, 1995; 109: 516-23. **4.** Hauser F, Poulsom R, Chinery R, *et al.* hP1.B, a human P-domain peptide homologous with rat intestinal trefoil factor, is expressed also in the ulcer-associated cell lineage and the uterus. Proc Natl Acad Sci U S A. 1993; 90: 6961-5. **5.** Longman RJ, Douthwaite J, Sylvester PA, *et al.* Coordinated localisation of mucins and trefoil peptides in the ulcer associated cell lineage and the gastrointestinal mucosa. Gut. 2000; 47: 792-800. **6.** Dignass A, Lynch-Devaney K, Kindon H, Thim L, Podolsky DK. Trefoil peptides promote epithelial migration through a transforming growth factor beta-independent pathway. J Clin Invest. 1994; 94: 376-83. **7.** Taupin DR, Kinoshita K, Podolsky DK. Intestinal trefoil factor confers colonic epithelial resistance to apoptosis. Proc Natl Acad Sci U S A. 2000; 97: 799-804. **8.** Saitoh T, Mochizuki T, Suda T, *et al.* Elevation of TFF1 gene expression during healing of gastric ulcer at non-ulcerated sites in the stomach: semiquantification using the single tube method of polymerase chain reaction. J Gastroenterol Hepatol. 2000; 15: 604-9. **9.** Langer G, Jagla W, Behrens-Baumann W, Walter S, Hoffmann W. Secretory peptides TFF1 and TFF3 synthesized in human conjunctival goblet cells. Invest Ophthalmol Vis Sci. 1999; 40: 2220-4. **10.** Pflugfelder SC, Tseng SC, Yoshino K, Monroy D, Felix C, Reis BL. Correlation of goblet cell density and mucosal epithelial membrane mucin expression with rose bengal staining in patients with ocular irritation. Ophthalmology. 1997; 104: 223-35. **11.** Lafontaine PO, Brignole F, Buron N, Solary E, Baudoin C, Bron AM, Garcher C. Assessment of ocular surface during graft versus host disease. Invest Ophthalmol Vis Sci. 2004; 45: ARVO-Abstract 133. **12.** Lafontaine PO, Buron N, Solary E, Bron AM, Garcher C. Assessment of TFF gene expression in normal and dry eye conjunctiva. Invest Ophthalmol Vis Sci. 2002; 43: ARVO-Abstract 101. **13.** Baudouin C, Brignole F, Becquet F, Pisella JP, Goguel A. Flow cytometry in impression cytology specimens: a new method for evaluation of conjunctival inflammation. Invest Ophthalmol Vis Sci, 1997; 3: 1458-64.

P197 DIFFERENCES IN PHYSICIAN RATINGS OF EFFICACY, TOLERABILITY AND PATIENT SATISFACTION BETWEEN THE UNITED STATES OF AMERICA AND GERMANY IN OCULAR HYPERTENSIVE PATIENTS

W.C. Stewart[1], T. Heinichen[2], P. Otte[2], U. Thelen[2]
[1]Pharmaceutical Research Network, LLC, Charleston, United States of America, [2]Private, Braunschweig, Germany

Purpose: To explore differences in physician ratings of ocular hypotensive (OHT) efficacy, tolerability and patient satisfaction with latanoprost in OHT patients in the United States (US) and Germany.
Design: A comparison of two prospective, longitudinal, observational trials of similar design.
Participants: The participants were OHT patients in the US or Germany.
Methods: We performed an interim analysis of OHT patients in a multi-year database in Germany that included 17,576 evaluable glaucoma and OHT patients with at least one visit, and, a multi-year database in the US that included 1216 OHT patients who were followed up to two years.
Main outcomes measures: The main outcomes measures are physician ratings of efficacy, tolerability and satisfaction.
Results: In the German study there were 353 OHT patients with at least six months follow-up, with an average of 2.2 years follow-up. In the US study 898 OHT patients completed up to Visit 2 within the first year (approximately six months). All evaluated patients in Germany were treated with latanoprost monotherapy, while the great majority of patients were treated with latanoprost monotherapy in the US study. The mean intraocular pressure (IOP) in Germany was 18.1 ± 2.5 mm Hg at six months and in the US study the IOP was 18.2 ± 3.8 mm Hg at Visit 2. Comparisons of physician ratings of treatment efficacy, tolerability and patient satisfaction with latanoprost at six months are shown in the table.
Conclusions: The large majority of ophthalmologists in Germany and US rated efficacy, tolerability and patient satisfaction with latanoprost between 'excellent' and 'very good'. However, physicians in the US are more likely to rate latanoprost therapy in OHT patients as 'excellent'. The reason for the rating differences remains unclear.
References:
1. Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714-20. **2.** Watson PG. Two years' experience of its use in the United Kingdom. Ophthalmology 1998;105:82-7. **3.** Day DG, Schacknow PN, Sharpe ED, *et al.* A persistency and economic analysis of latanoprost, bimatoprost, or beta-blockers in patients with open-angle glaucoma or ocular hypertension. J Ocul Pharmacol Ther 2004;20:383-92. **4.** Alm A, Schoenfelder J, McDermott J. A 5-year, multicenter, open-label, safety study of adjunctive latanoprost therapy for glaucoma. Arch Ophthalmol 2004;122:957-65. **5.** Diestelhorst M, Schaefer CP, Beusterien KM, *et al.* Persistency and clinical outcomes associated with latanoprost and beta-blocker monotherapy: evidence from a European retrospective cohort study. Eur J Ophthalmol 2003;13 Suppl 4:S21-9.

P198 EFFICACY, SAFETY AND TOLERABILITY OF GLAUCOMA MEDICINES AFTER 18 MONTHS IN GERMANY

U. Thelen[1], W.C. Stewart[2]
[1]Augenarztpraxis, Munster, Germany, [2]Pharmaceutical Research, Charleston, United States of America

Purpose: To evaluate the efficacy, safety and tolerability of glaucoma medicines after 18 months in patients with various types of glaucoma and ocular hypertension.
Design: A prospective, observational, longitudinal trial.
Participants: The participants were patients with ocular hypertension or glaucoma in Germany treated with a variety of medicines.
Methods: Data was collected from a four-year observational study.
Main outcomes measures: Intraocular pressure and physician ratings of efficacy, tolerability and patient satisfaction.
Results: Of the 17,576 evaluable patients in this study, 14,579 had at least one visit after baseline, representing 98,428 patient follow-up visits in 352 centers. For the 7,188 patients with at least 18 (± 3) months of follow-up, the mean time in the study was 2.6 years. Of these patients, 3,988 were female and 3,200 were male. The average age was 64.8 years. There were 5,426 with primary open-angle, 298 with normal tension, 294 with chronic angle closure, 178 with exfoliation and 434 with other forms of glaucoma, as well as 446 with ocular hypertension. The intraocular pressure (IOP) results for the most common treatment groups are shown in the table. The mean IOP for latanoprost based therapies, measured by Goldmann applanation tonometry, was < 18 mm Hg at each 3-month visit up to 18 months (range 17.1-17.4 mm Hg). Physicians judged patient efficacy with latanoprost as 'very good' to 'excellent' in 2,876 (60%), tolerability as 'very good' to 'excellent' in 3,055 (64%) and patient satisfaction as 'very good' to 'excellent' 2,990 (63%).
Conclusions: Latanoprost and latanoprost based adjunctive therapies in Germany provide consistent, effective and well-tolerated ocular hypotensive control in ocular hypertensive and glaucoma patients over 18 months of follow-up.
References:
1. Watson PG. Latanoprost. Two years' experience of its use in the United Kingdom. Latanoprost Study Group. Ophthalmology 1998;105:82-7. **2.** Day DG, Schacknow PN, Sharpe ED, *et al.* A persistency and economic analysis of latanoprost, bimatoprost, or beta-blockers in patients with open-angle glaucoma or ocular hypertension. J Ocul Pharmacol Ther 2004;20:383-92. **3.** Alm A, Schoenfelder J, McDermott J. A 5-year, multicenter, open-label, safety study of adjunctive latanoprost therapy for glaucoma. Arch Ophthalmol 2004;122:957-65. **4.** Diestelhorst M, Schaefer CP, Beusterien KM, *et al.* Persistency and clinical outcomes associated with latanoprost and beta-blocker monotherapy: evidence from a European retrospective cohort study. Eur J Ophthalmol 2003;13 Suppl 4:S21-9. **5.** Camras CB. Comparison of latanoprost and timolol in patients with ocular hypertension and glaucoma: a six-month masked, multicenter trial in the United States. The United States Latanoprost Study Group. Ophthalmology 1996;103:138-47.

P199 CHARACTERIZATION OF THE FREQUENCY AND REASONS FOR CHANGES IN PHARMACOTHERAPY IN THE TREATMENT OF PRIMARY OPEN-ANGLE GLAUCOMA, NORMAL TENSION GLAUCOMA, AND OCULAR HYPERTENSION

D. Montgomery[1], M.A. Mychaskiw[2]
[1]Glasgow Royal Infirmary, Glasgow, Scotland, United Kingdom, [2]Pfizer, Inc., New York, NY, United States of America

Purpose: The aim of this study was to determine the frequency and describe the reasons for changes in pharmacotherapy in the treatment of primary open-angle glaucoma (POAG), normal tension glaucoma (NTG), and ocular hypertension (OH).
Design: Retrospective cohort study of the Glasgow Royal Infirmary Glaucoma Database.
Participants: The database was comprised of computerized medical records of all POAG, NTG, and OH patients treated at the Glasgow Royal Infirmary from 1981 to present, representing 745 patients or >5,000 treatment years.
Methods: Data elements recorded for each patient included demographics, diagnosis, and treatment history. Treatment history included initial and subsequent medication regimens. Changes in medication regimens were categorized by failure to reach or maintain target pressure, adverse effects, disc and visual field progression, compliance, surgery or surgical failure, and other reasons for change. Descriptive statistics were used to analyze patient demographics and distributions by study variables.
Main outcome measures: Frequency of changes in pharmacotherapy and reasons for changes.
Results: Among the 745 patients, there were 2,049 changes in treatment during the study period. Frequency of treatment changes were failure to reach target pressure (29%), failure to maintain target pressure (17%), adverse effects (20%), surgery (11%), failure of surgery (5%), disc progression (5%), visual field progression (5%), compliance (3%), and other reasons (6%). Discontinuations due to adverse events were: brimonidine (44.7%), dorzolamide/timolol fixed combination (25.9%), travoprost (14.7%), bimatoprost (13.9%), timolol (11.0%), latanoprost/timolol fixed combination (8.6%), and latanoprost (8.4%).
Conclusions: Changes in treatment were most often associated with efficacy (failure to reach or maintain target pressure) and adverse effects. Discontinuations of therapy were greatest with brimonidine and lowest with latanoprost. Latanoprost and latanoprost fixed combination exhibited fewer discontinuations as a result of adverse effects in comparison to timolol or other prostaglandin monotherapies.
References:
1. Kobelt-Nguyen G, *et al.* Costs of treating primary open-angle glaucoma and ocular hypertension: A retrospective, observational two-year chart review of newly diagnosed patients in Sweden and the United States. J Glaucoma 1998;7:95-104. **2.** Reardon G *et al.* Patient persistency with topical ocular hypotensive therapy in a managed care population. Am J Ophthalmol 2004;137:S3-S12. **3.** Reardon G *et al.* Patient persistency with pharmacotherapy in the management of glaucoma. Eur J Ophthalmol 2003;14 (Suppl 4):S44-S52. **4.** Rouland J-F *et al.* What triggers change of therapy? *In*: Jönsson B, Krieglstein G, eds. Primary Open-angle Glaucoma: Differences in International Treatment Patterns and Costs. Oxford, UK: Isis Medical Media Ltd; 1999;161-168. **5.** Schwartz GF *et al.* Persistency with latnaoprost or timolol in primary open-angle glaucoma suspects. Am J Ophthalmol 2004;137:S13-S16.

P200 THE OCULAR SURFACE OF GLAUCOMA PATIENTS RECEIVING TOPICAL TREATMENTS EXPRESSES INFLAMMATORY MARKERS RELATED TO BOTH TH1 AND TH2 PATHWAYS

C. Baudouin[1], P. Hamard[2], D. Brémond-Gignac[3], C. Creuzot-Garcher[4], J.-M. Warnet[5], F. Brignole-Baudouin[5]
[1]Quinze-Vingts National Hospital, Paris, France, [2]XV-XX National Ophthalmology Hospital, Paris, France, [3]Robert Debré Hospital, APHP, Paris, France, [4]Dijon University Hospital, Dijon, France, [5]Lab. Toxicology, Paris 5 Univ., Paris, France

Purpose: To investigate the expression of CCR4 and CCR5 chemokine receptors, as markers of the TH1 and TH2 pathways, and HLA DR class II antigen in impression cytology specimens of conjunctival cells obtained from patients with long-term glaucoma treatment in comparison to atopic and normal subjects.
Design: Case-controlled study.
Participants: A total of 35 patients receiving long-term treatment for glaucoma, 20 suffering from vernal keratoconjunctivitis and 20 normal subjects with no ocular abnormality or topical treatment.
Methods: Impression cytology specimens were taken in one eye of each patient after they gave their informed consent and under approval of Dijon and Paris-6 university Ethics Committees. Conjunctival cells were extracted and incubated with monoclonal antibodies to CCR4, CCR5, two chemokines related to the TH2 and TH1 systems, respectively, CD45 and HLA DR, in order to quantify conjunctival inflammation. They were processed for flow cytometry and analyzed in a masked manner.
Main outcome measures: Immune markers in impression cytology specimens.
Results: HLA DR was expressed at high levels in the glaucoma group, as previously described, but at very low levels in allergic and normal eyes. CD45 was expressed by only few cells in all

three groups, with almost no significant differences. In contrast, CCR4 was expressed at significantly higher levels in allergic and glaucomatous eyes than in the normal group. As CCR4, CCR5 was significantly overexpressed in glaucomatous eyes, compared to normal eyes, but not in allergic ones.

Conclusions: This study confirms that various chemokine receptors may be overexpressed by the conjunctival epithelium in chronic ocular surface disorders. Their level of expression may vary according to the immune pathway involved, as immunoinflammatory reactions related to the TH1 or TH2 systems could be differentiated by the conjunctival CCR4/CCR5 profiles. Our results strongly evoke that, in contrast to allergic eyes involving the TH2 pathway as expected, long-term use of topical treatments may stimulate both TH1 and TH2 systems, suggesting a combination of allergic and inflammatory, most likely toxic, mechanisms.

References:

1. Baudouin C, Hamard P, Liang H, Creuzot-Garcher C, Bensoussan L, Brignole F. Conjunctival epithelial cell expression of interleukins and inflammatory markers in glaucoma patients treated over the long term. Ophthalmology 2004;111:2186-92. **2.** Pisella PJ, Debbasch C, Hamard P, Creuzot-Garcher C, Rat P, Brignole F, *et al*. Conjunctival proinflammatory and proapoptotic effects of latanoprost and preserved and unpreserved timolol: an ex vivo and *in vitro* study. Invest Ophthalmol Vis Sci 2004;45:1360-8. **3.** Andrew DP, Ruffing N, Kim CH, Miao W, Heath H, Li Y, *et al*. C-C chemokine receptor 4 expression defines a major subset of circulating nonintestinal memory T cells of both Th1 and Th2 potential. J Immunol 2001;166:103-11.

P201 TREATMENT PATTERNS AND PREDICTORS OF PERSISTENCE AND ADHERENCE IN A LARGE, NATIONAL SAMPLE OF INSURED PERSONS WITH OAG OR OAG SUSPICION

HA Quigley[1], DS Friedman[1], BL Nordstrom[2], E Mozzafari[3], AM Walker[4]
[1]Wilmer Institute, Johns Hopkins, Baltimore, MD, United States of America, [2]Ingenix Inc., Boston, MA, United States of America, [3]Pfizer, New York, NY, United States of America, [4]Ingenix Inc, Boston, MA, United States of America

Purposes: 1) To determine the treatment and management patterns applied to open angle glaucoma (OAG) patients and OAG suspects in a nationally representative sample identified by billing records; 2) To describe the patterns and predictors of treatment persistence and adherence among these diagnosed patients.

Design: A retrospective cohort study using health insurance claims data for persons enrolled with United Healthcare, including 35,754 suspects and 5,265 diagnosed as OAG.

Methods: Linked pharmacy and patient care data were used to examine the predictors of glaucoma management and treatment patterns. Cox proportional hazard models and logistic regression examined diagnosis, age, gender, region of the country, and diagnosis index date. Rates of monitoring (return visits, visual fields and optic nerve head imaging or photography) and treatment were calculated.

Main outcome measure: For newly treated OAG (n = 3,623) and treated suspect OAG (n = 1,677), we calculated the duration of continuous treatment with the initially prescribed medication (persistence) and the prevalence of use of the initial medication at various time points (adherence). The four drug classes were beta-blockers, alpha-agonists, carbonic anhydrase inhibitors, and prostaglandin analogs.

Results: After a median of 450 days of follow-up, only 61% of OAG had a billed follow-up office visit, 56% had at least one billed visual field, and 28% had optic nerve head imaging. One year after diagnosis, only 42% of OAG and 8% of suspects had received any treatment. Surgery and ALT were performed in < 3% of persons. Half of those who filled a glaucoma prescription discontinued all topical hypotensive therapy within six months, and only 37% had recently refilled the initial medication three years after first dispensing. Prostaglandins were associated with better persistence than other drugs (hazard ratios for discontinuation in OAG, prostaglandins *vs.* beta-blockers = 0.40 (95% CI, 0.35-0.44). OAG patients were more likely to adhere than suspects (OR = 1.21; 95% CI, 1.12-1.31). Adherence was highest among prostaglandin users (average over 60% at 3 years). Women were 24% less likely to undergo treatment than men (logistic regression, OR = 0.76, 95% CI 0.71, 0.81). Significantly more treatment was received by those with OAG compared to suspects, by older individuals, and by those followed for a longer period.

Conclusions: Many coded as OAG or suspects are lost to follow-up, or they are monitored and treated at rates lower than expected. Persistence and adherence were far from ideal, though better with prostaglandins than other drug classes. Women are less likely to be treated than men, despite being seen as often, field tested as often and having the diagnosis made at a rate appropriate to their representation. This result could come from physician bias in offering therapy, or from lower acceptance by women of offered treatment. Younger individuals were far less likely to be treated than older ones.

References:

1. Gurwitz JH, Glynn RJ, Monane M, Everitt DE, Gilden D, Smith N, Avorn J. Treatment for glaucoma: adherence by the elderly. Am J Public Health. 1993;83:711-6. **2.** Dasgupta S, Oates V, Bookhart BK, Vaziri B, Schwartz GF, Mozaffari E. Population-based persistency rates for topical glaucoma medications measured with pharmacy claims data. Am J Manag Care. 2002; 8(10 Suppl):S255-61. **3.** Albrecht KG, Lee PP. Conformance with preferred practice patterns in caring for patients with glaucoma. Ophthalmology 1994;101:1668-1671. **4.** Zhou Z, Althin R, Sforzolini BS, Dhawan R. Persistency and treatment failure in newly diagnosed open angle glaucoma patients in the United Kingdom. Br J Ophthalmol 2004;88:1391-4. **5.** Friedman DS, Nordstrom BL, Mozaffari E, Quigley HA. Women may be undertreated for adult-onset open-angle glaucoma Ophthalmology (accepted for publication).

P202 PREDICTIVE FACTORS FOR GLAUCOMA PROGRESSION: EVIDENCE FOR TARGET PRESSURE

F. Badala, K. Nouri-Mahdavi, J.C Caprioli
JSEI, UCLA, Los Angeles, CA, United States of America

Purpose: We have recently explored risk factors associated with visual field (VF) progression in the Advanced Glaucoma Intervention Study (AGIS) with pointwise linear regression (PLR). The purpose of this investigation is to evaluate predictive factors for VF progression and to explore evidence for establishing a target pressure.

Methods: We selected 509 eyes (401 patients) from AGIS with three or more years of follow-up, a minimum of seven visual fields and an AGIS reference score of 16 or better. Visual field status was evaluated at yearly intervals with PLR. VF progression was defined as worsening of at least two test locations within a Glaucoma Hemifield Test cluster confirmed in two subsequent PLR analyses. Cox proportional hazard regression model was used to assess risk factors for VF progression and to seek evidence for an interaction between IOP and baseline VF status.

Results: Visual field progression was detected in 210 eyes (41%). Older age at the onset of the study (p <0.001, HR = 1.30), increasing number of glaucoma interventions (p <0.001, HR = 1.64), male gender (p = 0.019, HR = 1.29), the TAT intervention sequence (p = 0.02, HR = 1.42), greater IOP fluctuation (p = 0.023, HR = 1.10), and a better baseline mean defect (p = 0.03, HR = 1.14) were associated with increased odds of VF progression. The IOP effect on VF progression was not related to baseline VF damage (no significant interaction between IOP and baseline VF status, p = 0.08).

Conclusions: No convincing evidence for establishing a target pressure based on the baseline VF damage was found. Older age and IOP fluctuation were confirmed to be important risk factors for VF progression.

References:

1. Nouri-Mahdavi K, Hoffman D, Coleman AL, Liu G, Li G, Gaasterland D, Caprioli J. Predictive factors for glaucomatous visual field progression in the Advanced Glaucoma Intervention Study. Ophthalmology. 2004 Sep;111(9):1627-35. **2.** The Advanced Glaucoma Intervention Study (AGIS): 7. The relationship between control of intraocular pressure and visual field deterioration. The AGIS Investigators. Am J Ophthalmol 2000;130:429-40. **3.** The Advanced Glaucoma Intervention Study (AGIS): 12. Baseline risk factors for sustained loss of visual field and visual acuity in patients with advanced glaucoma. Am J Ophthalmol 2002;134:499-512. **4.** Schmoor C, Ulm K, Schumacher M. Comparison of the Cox model and the regression tree procedure in analyzing a randomized clinical trial. Stat. Med. 1993 - 12, 2351-2366. **5.** Breiman L, Friedman JH, Olshen RA, Stone CJ. Classification and Regression Trees. Belmont, Calif.: Wadsworth International Group.

P203 PREDICTORS OF TREATMENT AND THE LIKELIHOOD OF ONGOING MEDICATION USE AMONG INDIVDUALS DIAGNOSED AS HAVING GLAUCOMA OR AS GLAUCOMA SUSPECTS

S. Friedman, B. Nordstrom, E. Mozaffari, H.A. Quigley
Johns Hopkins Wilmer Eye Institute, Baltimore, MD, United States of America

Introduction: To determine the predictors of treatment, the treatment patterns, and predictors of treatment persistence and adherence for glaucoma and suspect glaucoma patients in a nationally representative sample of diagnosed persons.

Methods: Retrospective cohort study using health insurance claims of 35,754 new glaucoma suspects and 5,265 new open angle glaucoma patients. Linked pharmacy and patient care information were used to assess factors possibly predictive of treatment (argon laser trabeculoplasty (ALT), surgery, or topical ocular hypotensives). Rates of subsequent visits, disc images and visual fields were calculated from coded information. Linked pharmacy and patient care data were used to calculate duration of continuous treatment with initially prescribed topical medication (persistence) and the prevalence of medication use (adherence). A logistic regression model adjusting for diagnostic group (suspect *vs.* diagnosed), age group, sex, region of the country, date of initial diagnosis divided into two periods (1995 - 1998 and 1999 - 2001), and length of follow-up was performed to assess the predictors of treatment and persistence/adherence in this cohort.

Results: Treatment was prescribed in 42% of glaucoma and 8% of suspects. Women were less likely to undergo treatment (topical ocular hypotensives, ALT, or surgery) than men (OR = 0.76, 95% CI 0.71, 0.81). Factors other than gender that were associated with greater likelihood of treatment were glaucoma diagnosis, older age, region, and longer follow-up. Half of those filling an initial prescription discontinued therapy within six months and only 37% had recently refilled their initial medication three years after dispensing. Prostaglandins were associated with better persistence and adherence among glaucoma patients (hazard ratios for discontinuation compared with beta-blockers = 0.40 (95% CI, 0.35-0.44)). Glaucoma patients were more likely to adhere than suspects (OR = 1.21; 95% CI, 1.12-1.31).

Conclusions: Many glaucoma or glaucoma suspects discontinue care and are monitored and treated at rates lower than expected. Persistence and adherence are substantially better with prostaglandins than with other drugs. Patients diagnosed with glaucoma are more likely to adhere to treatment than glaucoma suspects. Furthermore, there is variation in treatment among individuals diagnosed as having glaucoma or as glaucoma suspects. Women were 24% less likely to be treated than men, and younger individuals were less likely to be treated than older ones. Understanding the reasons for poor adherence and persistence as well as the sources of variation in treatment will help in determining how to arrive at better management strategies for individuals with glaucoma and suspect glaucoma.

References:

1. Williams D, Bennett K, Feely J. Evidence for an age and gender bias in the secondary prevention of ischaemic heart disease in primary care. Br J Clin Pharmacol 2003;55:604-608. **2.** Valentin A, Jordan B, Lang T, Hiesmayr M, Metnitz PG. Gender-related differences in intensive care: a multiple-center cohort study of therapeutic interventions and outcome in critically ill patients. Crit Care Med 2003;31:1901-1907. **3.** Gurwitz JH, Glynn RJ, Monane M, Everitt DE, Gilden D, Smith N, Avorn J. Treatment for glaucoma: adherence by the elderly. Am J Public Health 1993;83:711-716. **4.** Gurwitz JH, Yeomans SM, Glynn RJ, Lewis BE, Levin R, Avorn J. Patient noncompliance in the managed care setting. The case of medical therapy for glaucoma. Med Care 1998;36:357-369. **5.** Schwartz GF, Reardon G, Mozaffari E. Persistency with latanoprost or timolol in primary open-angle glaucoma suspects. Am J Ophthalmol 2004;137(1 Suppl): S13-S16.

P204 EXPERIMENTAL MODEL OF ENDOTHELIUM DAMAGE IN RABBIT BY ANTI-GLAUCOMATOUS DRUGS IN EYES WITH AUTOGRAFT OF CORNEA

P. Chiaradia[1], J.F. Casiraghi[2], P.I. Lavena[1]
[1]Hospital de Clínicas, Buenos Aires, Argentina, [2]Hospital de Clinicas, Buenos Aires, Argentina

Purpose: To determine the endothelium damage after the administration of antiglaucomatous drugs, latanoprost 0.005% or dorzolamide 2% on corneal graft survival in rabbit.

Design: Experimental study in rabbit.

Control: Ten rabbits, between twelve to fifteen months old were obtained from the Research Center of the University of de Buenos Aires. The animals were treated according to the 'Declaration of Helsinki'.

Methods: Ten rabbits who received autograft were placed in two treatment groups: Latanoprost 0.005% (rigth eye) or dorzolamide 2% (left eye), none received another systemic or topical medication. Ultrasound pachymetry was performed on week 0, 4, 10, 17 and 27, to assess endothelial function. A total of three measurements per eye was required. Furthermore biomicroscopy were performed in search of rejection episodes. The study was a duration of 27 weeks. None of the specimens was evidence of ocular disease before surgery. The twenty penetrating keratoplasties were performed by one surgeon (CH.P) at the Research Center of the University of de Buenos Aires.

Main outcome measures: Ultrasound pachymetry. Biomicroscopy were performed every week.

Results: The final model included the treatment effect (p=0,008), time effect (p=0,04) and the interaction (0,01). The corneal thickness measures are summarize on table 1. There were no surgical complications. The eyes with penetrating keratoplasty who received dorzolamide 2% there were rejection episodes.One of the eyes who received dorzolamide was excluded of the study by to show endophthalmitis.

Conclusions: This preliminary study support the hypothesis that dorzolamide 2% in eyes with penetrating keratoplasty could have a potential negative effect: endothelium damage and graft failure. Ultrasound pachymetry may permit the identification of this changes.

P205 A COMPARISON OF THE FIXED COMBINATION OF DORZOLAMIDE AND TIMOLOL WITH THE FIXED COMBINATION OF LATANOPROST AND TIMOLOL IN PATIENTS WITH ELEVATED INTRAOCULAR PRESSURE. A 3 YEAR FOLLOW-UP, NON-RANDOMIZED STUDY

B. Pajic[1], B. Pajic-Eggspuehler[2]
[1]Klinik Pallas, Olten, Switzerland, [2]AugenZentrumPajic, Reinach, Switzerland

Purpose: To compare the intraocular pressure (IOP) reducing effect, visual field changing and safety of the fixed combination of dorzolamide and timolol with that of the fixed combination of latanoprost and timolol in patients with elevated IOP.

Design: Non-randomized clinical trial.

Participants: Data of 165 non-randomized patients (dorzolamide/timolol, 83; latanoprost/timolol, 82) were included in this analysis.

Methods: In this 36-month non-randomized study, patients with new diagnosis of glaucoma or ocular hypertension received either a fixed combination of dorzolamide/timolol or latanoprost/timolol. Parameters recorded: patients demographics, IOP, automated visual field testing (Octopus 101), Laser-Scanning-Tomography of the optic nerv disc, visual acuity, biomicroscopy examination from baseline to month 36, reasons for discontinuation and side effects.
Main outcome measures: Regarding the baseline measure the IOP reduction effect were in both groups significant at any time (P<0.001). The difference between groups was not significant at any time. The automated visual field testing measured parameters MS, MD, LV were between groups at baseline no significant (P=0.84). Regarding the baseline there was in the dorzolamide/timolol group a significant difference at month 12, 24 and 36 with increasing of MS, decreasing of MD and LV(P<0.05). In the latanoprost/timolol group there was no significant difference at any time (p>0.1).
Results: Baseline diurnal IOP levels were similar: dorzolamide/timolol, 27.5 ± 2.97 mmHg; latanoprost/timolol, 25.4 ± 2.67 mmHg; P=0.84. At month 6, 12, 24, 36 levels were 16.5 ± 3.9 mmHg, 13.2 ± 2.1 mmHg, 14.3 ± 2.5 mmHg, 13.8 ±1.7 mmHg in dorzolamide/timolol patients and 16.2 ± 2.0 mmHg, 12.7 ± 1.5 mmHg, 13.4 ± 1.8 mmHg, 13.6 ± 2.1 mmHg in latanoprost/timolol patients (P<0.001). The difference between groups was not significant at any time (month 6 (P=0.60), month 12 (P=0.39), month 24 (P=0.41), month 36 (P=0.28)). Overall, 86.7% and 87.8% of patients receiving dorzolamide/timolol *versus* latanoprost/timolol, respectively, reported no adverse event.
Conclusions: The fixed combination of dorzolamide/timolol administered twice daily and latanoprost/timolol once daily is both well-tolerated and highly efficacious. The visual field improvement in the dorzolamide/timolol group may have the reason consequently of better perfusion conditioned through dorzolamide.
References:
1. Pajic B. Experience with Cosopt, the fixed combination of Timolol and Dorzolamide, gained in Swiss ophthalmologist's office. Current Medical Research and Opinion 2003,19, 95-101. **2.** Garcia-Sanchez J, Rouland JF,Spiegel D, Pajic B, Cunliffe I, Traverso C, Landry J A comparison of the fixed combinations of latanoprost and timolol with the unfixed combination of brimonidine and timolol in patients with elevated intraocular pressure. A six month, evaluator masked, multicentre study in Europe. Br J Ophthalmol 2004; 88, 877-883. **3.** O'Connor DJ, Martone JF, Mead AM. Additive intraocular pressure lowering effect of various medications with latanoprost. Am J Ophthalmol 2002;133:836-7. **4.** Weinreb RN. Compliance with medical treatment of glaucoma. J Glaucoma 1992;1:134-6. **5.** Pfeiffer N. A comparison of the fixed combination of latanoprost and timolol with its individual components. Graefe's Arch Clin Exp Ophthalmol 2002;240:893-9.

P206 COMPARITIVE EFFICACY OF LATANOPROST AND BRIMONIDINE IN PATIENTS OF PRIMARY OPEN ANGLE GLAUCOMA (POAG) AND OCULAR HYPERTENSION (OH) IN NORTH INDIAN POPULATION
S. Gupta, S. Goyal, S. Sood
G.M.C.H. Chandigarh, India, Chandigarh, India

Introduction: With the advent of newer antiglaucoma medications, the glaucomatologist now has a variety of options in the medical management of glaucoma. Prostaglandins like Latanoprost and α2 -agonists like Brimonidine are being prescribed more commonly all over the world for the management of primary open angle glaucoma (POAG).
***Aim*:** To compare the efficacy of latanoprost 0.005% and brimonidine 0.2% in patients of POAG and OH in North Indian population.
Methods: A prospective randomized uncontrolled study was carried out in 50 patients of glaucoma clinic of Government Medical College and Hospital , Chandigarh, India. Group 1 (25 patients) was started on Latanoprost 0.005% once a day and group 2 (25 patients) was put on Brimonidine 0.2% twice daily. Complete ophthalmic examination including slit lamp,goldmann applanation tonometry, gonioscopy and visual fields with Humphery Field Analyser(HFA-730) was carried out in all patients.
Results: Mean baseline IOP in two groups was 24.4 mmHg ± 4.9 and 23.2 mmHg ± 4.8 respectively. The mean IOP at 8 weeks was13.6 mmHg ± 3.68 and 16.13mmHg ± 4.01 in groups 1 and 2 respectively. Mean IOP at 12 weeks was 12.6 mmHg ± 3.58 and 15.6mmHg ± 3.9 in groups 1 and 2 respectively. Both Latanoprost and Brimonidine lowered IOP significantly from baseline (p<0.001) at all follow up visits. The IOP lowering effect of Latanoprost was significantly more than Brimonidine (p<0.001)at all follow up visits.Two patients (8%) in each group had conjunctival hyperemia and irritation.
Conclusion: Both Latanoprost and Brimonidine significantly lower IOP in glaucoma patients. The IOP lowering effect of Latanoprost is more than Brimonidine at all follow up visits. Both Latanoprost and Brimonidine are effective and well tolerated in North Indian population.
References:
1. Schuman JS, Horwitz B, Choplin NT, David R, Albracht D, Chen K. A controlled randomized, Multicentric Clinical Trial, A 1 year study of Brimonidine twice daily in Glaucoma and Ocular Hypertension. Arch Ophthalmol 1997;115:847-52. **2.** Stewart WC, Day DG, Stewart JA, Schuhr J, Latham KE. The efficacy and safety of Latanoprost 0.005% Once a daily *Versus* Brimonidine 0.2% Twice daily in a Open Angle Glaucoma or Ocular Hypertension . Am J Ophthalmol 2001; 131:631 –35. **3.** Azuara –Blanco A, Katz LJ, Spaeth GI, Wilson RP, Moster MR, Flartey KJ. Effect of Latanoprost on intraocular pressure in patients with glaucoma on maximal tolerated medical treatment. Br J Ophthalmol 1997;81 :1116. **4.** Walters DR. Development and use of Brimonidine in treating acute and chronic elevation of intraocular pressure. A rewiew of safety, efficacy and dosing studies. Survey of Ophthalmology 41;1996: S19-S26. **5.** Thomas R, Parikh R, Muliyil J, PH, George R, Paul P. Comparison between Latanoprost and Brimonidine efficacy and safety in Indian eyes. Indian J Ophthalmol 2003;51:123-28.

P207 MORNING *VS.* EVENING USE OF XALACOM ® FOR PIMARY OPEN-ANGLE GLAUCOMA
C. Hartleben[1], M. Ayala[2], R. Chavez-Anaya[3], A. García-López[2], O. Garza-Saide[4], F. Gil-Carrasco[5], F. Gutiérrez[6], C. Naranjo[7], M. Ramírez[8], S. Sarmina[9], H. Vásquez[10], G. Velasco[11]
[1]Instituto de Oftalmologia, México DF, Mexico, [2]Hospital de la Luz, Mexico DF, Mexico, [3]IMSS, Culiacan, Mexico, [4]Instituto de Oftalmologia del N., Monterrey, Mexico, [5]A.P.E.C., México DF, Mexico, [6]Inst. de Oft. del Occidente, Guadalajara, Mexico, [7]IMSS de Occidente, Guadalajara, Mexico, [8]Inst. de Salubridad, Tijuana, Mexico, [9]ISSTE López Mateos, MéXICO DF, Mexico, [11]Universidad de Nuevo Leon, Monterrey, Mexico

Introduction: The use of combined drugs increases compliance and allows a better IOP control of open-angle glaucoma. While latanoprost usually is instilled by night, timolol is more effective in the mornings. The purpose of this study is to evaluate the efficacy of morning *vs.* evening application of a fixed combination of timolol and latanoprost, and to evaluate trough values for evening application *vs.* morning aplication, plus the peak effect two hs. after morning instillation.
Aim of the study: To evaluate whether morning or evening application of Xalacom® is more efficaceous.
Design: A prospective, multicenter, open-label randomized, comparative cross-over eight-week study was carried out.
Participants: After informed consent, 34 patients who had previously used timolol without adequate pressure control were randomly assigned without a washout period, to Group I, with morning instillation of Xalacom for four weeks, and then assigned to instill it during the evening for another four weeks, or Group II, which started with an evening application, and after crossover at four weeks, morning instillation. The trough (12 hs) IOP (8am) for the evening application was compared to the morning instillation (trough effect at 24 hrs). Patients functioned as their own control, with crossover to the opposite instillation form after four weeks, and morning *vs.* evening efficacy was compared. Blood pressure and pulse were measured for systemic safety.
Main outcome measures: IOP in Group I (morning application) at 4 weeks had a 4.7 ± 1.7 mm Hg reduction at 24 hour trough, which meant a 25% pressure reduction, p= 0.002. Group II (evening application at four weeks, 12 hour trough values) had a 5.3 ± 2.0 mmHg pressure reduction, *i.e.* 29% p=0.001. After crossover, Group I now with evening application, had morning IOPs of 14.3 mm hg 29.2% p=0.005 from baseline, while Group II (morning application, 24 hour trough measurement) had a mean IOP of 16.3 mm Hg, or 23.5% p=0.002. Four cases had mild hyperaemia, and no adverse sistemic side effects were reported.
Conclusions: Xalacom® had good pressure lowering effect compared to previous timolol use (23.5-25% added IOP pressure reduction at trough effect at 12 and 24 hours, respectively. There is a 1.6 mm Hg difference in favor of the evening application, but this was measured at 24 trough effect.
References:
1. Camras, C.B., The United States Latanoprost Study Group. Comparison of Latanoprost and Timolol in patients with ocular hypertension and glaucoma. A six-month, masked, multicenter trial in the United States. Ophthalmology 1996; 103: 138-147. **2.** Camras, C.B., Wax M.B.O. and Ritch R., *et al*: Latanoprost treatment for glaucoma: effects of treating for 1 year and switching from timolol. Am J Ophtalmol 1998; 126: 390-399. **3.** Razz P, Ruzsonyi M.R. Nagy Z.T *et al*: Around the Clock Intraocular Pressure Reduction with Once-Daily Application of Lantanoprost by itself or in Combination with Timolol. Arch Ophthalmol 1996: 114 : 268-273. **4.** Rulo A.H., Greve E.L., Hoyng P.F.: Additive effect of Latanoprost, a prostaglandin F2a Analogue, and timolol in patients with elevated intraocular pressure. Br. J Opthalmol 1994; 78: 899-902. **5.** Alm A., Widengard I, Kjellgren D., Soderstrom M., Fristrom B, Heijl A., and Stjernschantz J: Latanoprost administered once daily caused a mantained reduction of intraocular pressure in glaucoma patients treated concomitantly with timolol. Br J Ophthalmol 1995; 79: 12-16. **6.** Kostas, A.G. *et al*: A Comparison of once-daily morning *vs* evening dosing of concomitant latanoprost and timolol, Am J Ophtalmol 2002, Jun 133 6: 753-7.

P208 COMPARISON OF EFFECTS OF LATANOPROST ADMINISTERED AT TWO DIFFERENT TIMES ON DIURNAL VARIATION OF INTRAOCULAR PRESSURE IN NORMAL-TENSION GLAUCOMA
N. Yasuda, K. Nakamoto
Tokyo Metropolitan Police Hospital, Tokyo, Japan

Introduction: It has been reported that latanoprost (Lat) is effective in lowering intraocular pressure (IOP) for 24 hours after administration[1-5], and is most effective in the 12-hour to 24-hour period after administration[1]. Evening dosing of Lat may be more effective in the daytime than in the nighttime[2,3]. However it is not fully clear whether diurnal variations of IOP differ according to the time of Lat administration.
Aim of the study: To determine whether diurnal variations of IOP differs according to the time of Lat administration in normal-tension glaucoma (NTG).
Design: Randomized clinical trial.
Participants: Thirteen NTG patients.
Methods: A total of 26 eyes of 13 NTG patients (aged 54.8 ± 11.1, 5 men and 8 women) were included. Patients had to have an IOP difference less than 1 mmHg between the right and left eye in mean diurnal IOP (mean of untreated diurnal IOPs measured at all time points). Patients with any condition precluding reliable IOP measurement or poor compliance were excluded. After a washout period of four weeks or longer, patients were hospitalized, and IOP was measured at 10:00, 13:00, 16:00, 19:00, 22:00, 1:00, 3:00, and 7:00 with a Goldmann applanation tonometer. Then, randomly assigned one eye of each patient was administered with Lat at 8:00 (morning dose group) and the other eye, at 22:00 pm (evening dose group). After eight weeks of treatment, patients were again hospitalized for IOP measurement in the same way as was done when they were untreated. Before treatment, there was no significant difference between two groups in IOP at any time point of measurement or mean diurnal IOP.
Main outcome measures: Percent reduction in the diurnal variation of IOP.
Results: Lat administered for eight weeks in NTG lowered IOP significantly at all time points of measurement, in morning dose group as well as in evening dose group ($p < 0.05$). Compared to morning dose group, IOP reduction at 7:00 was greater in evening dose group (10.1 ± 15.1% and 21.2 ± 10.1%, respectively; $p = 0.004$).
Conclusion: Lat is more effectively administered in the evening than in the morning in lowering daytime IOP in NTG.
References:
1. Konstas AGP, *et al*: Am J Ophthalmol 1999;128:15-20. **2.** Mishima HK,*et al*: Surv Ophthalmol 1997; 41:139-144. **3.** Nakamoto K, *et al*: Nippon Ganka Gakkai Zasshi 2004;108: 401-7. **4.** Orzalesi N, *et al*:Invest Ophthalmol Vis Sci 2000;41:2566-2573. **5.** Liu JH, *et al*:Am J Ophthalmol 2004; 138: 389-395.

P209 IOP-LOWERING EFFICACY OF BIMATOPROST 0.03% AND TRAVOPROST 0.004% IN PATIENTS WITH GLAUCOMA OR OCULAR HYPERTENSION
S.T. Simmons[1], L.B. Cantor[2]
[1]Glaucoma Consultants of the Capital Regi, Slingerlands, NY, United States of America, [2]Indiana University, Indianapolis, IN, United States of America

Purpose: To evaluate the IOP-lowering efficacy of bimatoprost and travoprost for the treatment of glaucoma and ocular hypertension.
Design: Randomized, investigator-masked, parallel-group clinical trial.
Participants: Patients (n=158) with glaucoma or ocular hypertension.
Main outcome measure: IOP lowering at each diurnal time point after six months of treatment.
Methods: After completing a washout from all glaucoma medications, patients were randomized to bimatoprost or travoprost for six months. Visits were at baseline, week 1, and months 1, 3, and 6. IOP was measured at 9 AM at each visit and also at 1PM and 4PM at baseline and months 3 and 6.
Results: At the baseline visit, there were no significant between-group differences in IOP at 9AM, 1PM, or 4PM (P>.731). After six months of therapy, both medications provided significant mean reductions from baseline IOP at every time point (P<.001). Bimatoprost provided greater mean IOP reductions from baseline than travoprost at every time point at each follow up study visit and these differences were statistically significant at every visit at 9AM. After 6 months of therapy, the mean IOP reduction at 9AM was 7.2 mm Hg (28.3%) with bimatoprost and 5.4 mm Hg (22.3%) with travoprost (P=.005). At 1PM, the mean IOP reduction was 6.0 mm Hg with bimatoprost (25.7%) and 4.9 mm Hg (21.1%) with travoprost (P=.058). Finally, bimatoprost continued to provide greater IOP lowering than travoprost at 4PM, with a mean bimatoprost-provided IOP reduction of 5.5 mm Hg (23.3%) *versus* a mean travoprost-provided IOP reduction of 4.3 mm Hg (18.1%, P=.086). Both study medications were well tolerated and ocular redness was the most commonly reported adverse event in both treatment groups.
Conclusion: Results of the present study support previous studies that found that bimatoprost provides highly efficacious IOP lowering[1-3] and is more effective than travoprost.[4,5].
References:
1. Higginbotham EJ, Schuman JS, Goldberg I, *et al.* One-year, randomized study comparing bimatoprost and timolol in glaucoma and ocular hypertension. Arch Ophthalmol. 2002;120:1286-93. **2.** Noecker RJ, Dirks MS, Choplin NT, *et al.* A six-month randomized clinical trial compar-

ing the intraocular pressure-lowering efficacy of bimatoprost and latanoprost in patients with ocular hypertension or glaucoma. Am J Ophthalmol. 2003;135:55-63. **3.** Gandolfi S, Simmons ST, Sturm R, Chen K, VanDenburgh AM, The Bimatoprost Study Group 3. Three-month comparison of bimatoprost and latanoprost in patients with glaucoma and ocular hypertension. Adv. Ther. 2001;18:110-121. **4.** Parrish RK, Palmberg P, Sheu w-p, for the XLT study group. A comparison of latanoprost, bimatoprost, and travoprost in patients with elevated intraocular pressure: a 12-week, randomized, masked-evaluator multicenter study. Am J Ophthalmol. 2003;135:688-703. **5.** Noecker RJ, Earl ML, Mundorf T, *et al*. Bimatoprost 0.03% *versus* travoprost 0.004% in black Americans with glaucoma or ocular hypertension. Adv Ther. 2003;20:121-8.

P210 EVALUATION OF THE IOP LOWERING EFFICACY OF BIMATOPROST AND LATANOPROST IN THE TREATMENT OF NORMAL TENSION GLAUCOMA

R.J. Noecker[1], M. Dirks[2], M.L. Earl[3], R.D. Williams[4]
[1]University of Pittsburgh Eye & Ear Inst, Pittsburgh, PA, United States of America, [2]Black Hills Regional Eye Inst., Rapid City, United States of America, [3]IMEDS, Riverside, CA, United States of America, [4]Taustine Eye Center, Louisville, KY, United States of America

Purpose: Evaluate the IOP-lowering efficacy of bimatoprost 0.03% and latanoprost 0.005% in patients with normal tension glaucoma (NTG).
Design: Randomized, double-masked, multi-center clinical trial.
Participants: Sixty patients with a diagnosis of NTG.
Methods: Patients were randomized to either bimatoprost or latanoprost for three months. Diurnal IOP measurements (8 AM, 12 noon, and 4 PM) were recorded at each study visit (baseline, and months 1 and 3). In enrolled patients, the mean of the baseline diurnal IOP measurements was < 20 mm Hg, with no measurement > 24 mm Hg and no more than 1 measurement of 23 or 24 mm Hg.
Main outcome measure: IOP-lowering after 3 months of treatment.
Results: There were no significant between-group differences in baseline mean IOP at any time point (P>.221). Both bimatoprost and latanoprost provided significant reductions from baseline IOP at all diurnal measurements (P<.001). After 3 months of treatment, mean IOP reductions from baseline ranged from 2.8 to 3.8 mm Hg (18%–22%) with bimatoprost and from 2.1 to 2.6 mm Hg (13%–16%) with latanoprost. The overall mean reduction in IOP after 3 months of treatment was 3.4 mm Hg (20%) with bimatoprost and 2.3 mm Hg (15%) with latanoprost (P=.035). There were no significant between-group differences in adverse event incidence, clinical success, or demographic variables.
Conclusion: Bimatoprost has been shown to effectively lower IOP in patients with glaucoma or ocular hypertension in numerous clinical trials[1-4]. Even in the absence of elevated IOP, IOP lowering has been proven to reduce the risk of glaucomatous progression in patients with NTG[5]. Results from this study demonstrate that bimatoprost and latanoprost effectively reduce IOP in patients with NTG. The overall mean IOP reductions were statistically significantly greater with bimatoprost than with latanoprost.
References:
1. Higginbotham EJ, Schuman JS, Goldberg I, *et al*. One-year, randomized study comparing bimatoprost and timolol in glaucoma and ocular hypertension. Arch Ophthalmol. 2002;120:1286-93. **2.** Noecker RJ, Dirks MS, Choplin NT, *et al*. A six-month randomized clinical trial comparing the intraocular pressure-lowering efficacy of bimatoprost and latanoprost in patients with ocular hypertension or glaucoma. Am J Ophthalmol. 2003;135:55-63. **3.** Gandolfi S, Simmons ST, Sturm R, Chen K, VanDenburgh AM, The Bimatoprost Study Group 3. Three-month comparison of bimatoprost and latanoprost in patients with glaucoma and ocular hypertension. Adv. Ther. 2001;18:110-121. **4.** DuBiner H, Cooke D, Dirks M, Stewart WC, Vandenburgh AM, Felix C. Efficacy and safety of bimatoprost in patients with elevated IOP: A 30-day comparison with latanoprost. Surv. Ophthalmol. 2001;45(Suppl 4):S353-360. **5.** Collaborative Normal-Tension Glaucoma Study Group. Comparison of glaucomatous progression between untreated patients with normal-tension glaucoma and patients with therapeutically reduced intraocular pressures. Am. J. Ophthalmol. 1998;26:487-497. Published erratum appears in Am. J. Ophthalmol. 1999;27: 120.

P211 IOP-LOWERING EFFICACY OF BIMATOPROST 0.03% *VERSUS* LATANOPROST 0.005%: A BILATERAL MONOCULAR TRIAL

R.J. Noecker[1], T. Mundorf[2], M. Dirks[3], M.L. Earl[4]
[1]University of Pittsburgh Eye & Ear Inst, Pittsburgh, PA, United States of America, [2]Mundorf Eye Center, Charlotte, United States of America, [3]Black Hills Regional Eye Inst., Rapid City, United States of America, [4]IMEDS, Riverside, CA, United States of America

Purpose: Evaluate the IOP-lowering efficacy of bimatoprost 0.03% and latanoprost 0.005%, using each patient as their own control.
Design: Multi-center, randomized, investigator-masked, paired-comparison trial.
Participants: Patients (n=83) with bilateral glaucoma or ocular hypertension.
Methods: Patients with an untreated IOP between 22-34 mm Hg, and no more than a 2 mm Hg between eye difference in IOP were randomized to use bimatoprost in one eye and latanoprost in the other for 2 months. Study visits were at baseline and months 1 and 2.
Main outcome measure: IOP lowering after two months of treatment.
Results: Baseline IOP was similar between latanoprost and bimatoprost treated eyes (24.2 *vs.* 24.3 mmHg, P=.510). At month 1, the mean IOP reduction from baseline was 7.7 mm Hg (31.5%) in bimatoprost-treated eyes, compared with 6.4 mm Hg (26.4%) in the latanoprost-treated eyes (difference of 1.3 mm Hg, P<.001). At month 2, the mean IOP reduction from baseline was 7.0 mm Hg (28.5%) in the bimatoprost-treated eyes and 5.7 mm Hg (23.4%) in the latanoprost-treated eyes (difference of 1.3 mm Hg, P<.001). The most common adverse event with both medications was conjunctival hyperemia (25% in bimatoprost and 15% in latanoprost-treated eyes).
Conclusion: Reducing IOP is the only accepted treatment for glaucoma or ocular hypertension and every millimeter of IOP lowering reduces the risk of glaucomatous progression.[1] These data support previous studies indicating that bimatoprost provides greater IOP lowering than latanoprost[2-5]. This is the first study demonstrating that bimatoprost provides greater IOP lowering than latanoprost when comparing different eyes of the same patient.
References:
1. Heijl A, Leske MC, Bengtsson B, Hyman L, Bengtsson B, Hussein M; Early Manifest Glaucoma Trial Group. Reduction of intraocular pressure and glaucoma progression: results from the Early Manifest Glaucoma Trial. Arch Ophthalmol. 2002 Oct;120(10):1268-79. **2.** Noecker RJ, Dirks MS, Choplin NT, *et al*. A six-month randomized clinical trial comparing the intraocular pressure-lowering efficacy of bimatoprost and latanoprost in patients with ocular hypertension or glaucoma. Am J Ophthalmol. 2003;135:55-63. **3.** Gandolfi S, Simmons ST, Sturm R, Chen K, VanDenburgh AM, The Bimatoprost Study Group 3. Three-month comparison of bimatoprost and latanoprost in patients with glaucoma and ocular hypertension. Adv. Ther. 2001;18:110-121. **4.** DuBiner H, Cooke D, Dirks M, Stewart WC, Vandenburgh AM, Felix C. Efficacy and safety of bimatoprost in patients with elevated IOP: A 30-day comparison with latanoprost. Surv. Ophthalmol. 2001;45(Suppl 4):S353-360. **5.** Parrish RK, Palmberg P, Sheu w-p, for the xlt study group. A comparison of latanoprost, bimatoprost, and travoprost in patients with elevated intraocular pressure: a 12-week, randomized, masked-evaluator multicenter study. Am J Ophthalmol. 2003;135:688-703.

P212 DOES CO-ADMINISTRATION OF A NONSTREOIDAL ANTI-INFLAMMATORY DRUG INFLUENCE INTRAOCULAR PRESSURE REDUCTION BY BIMATOPROST?

E.F. Baser, G. Seymenoglu, G. Dinc, C. Guler
Celal Bayar University Hospital, Manisa, Turkey

Introduction: Topical and oral co-administration of non-stereoidal anti-inflammatory (NSAI) drugs have been shown to reduce the ocular hypotensive effects of various antiglaucoma solutions, including prostaglandins analogs[1,2]. Although speculative, bimatoprost is classified as a prostamide[3]. Prostamides are biosynthesized from anandamide in a pathway which includes cylcooxygenase[2] and have potential pro-inflammatory effects[3,4]. Bimatoprost ophthalmic solution has been reported to have inflammatory side effects similar to prostaglandins[4-7]. Taken together, concomitantly used NSAI drugs -which suppress the activity of cylcooxygenases- might interfere with intraocular pressure (IOP) reduction by bimatoprost ophthalmic solution.
Aims of the study: To investigate the effects of a NSAI ophthalmic solution on bimatoprost induced IOP reduction using ocular hypertension (OH) patients.
Methods: Thirty OH patients were enrolled in this prospective and observer masked study. After measurement of basal IOP, bimatoprost ophthalmic solution was administered once daily to one randomly selected eye of each patient. Four weeks later, a NSAI ophthalmic solution, indomethacin, was co-administered four times daily for two weeks. Then indomethacin was withdrawn and bimatoprost was continuously administered for another two weeks and then withdrawn. Following a four weeks washout, only indomethacin solution was administered for two weeks. During the study, all IOP measurements were performed in an observer masked fashion.
Results: Baseline IOP was 23.35 ± 1.78 mm Hg. Bimatoprost administration reduced the IOP to 16.47 ± 1.94 mm Hg at the end of 4 weeks (p=0.00). However when indomethacin was co-administered for two weeks , mean IOP was 19.33 ± 1.95 mmHg (p=0.00). After withdrawal of indomethacin, mean IOP was 16.73 ± 1.98 mm Hg (p=0.00). Following washout of bimatoprost, re-administration of only NSAI solution had no significant effect on IOP (p=0.53).
Conclusion: Our findings indicate that a NSAI solution may influence the IOP reduction induced by bimatoprost. This should be taken into account when treating OH or glaucoma patients using bimatoprost.
References:
1. Sponsel WE, Paris G, Trigo Y, Pena M, *et al*: Latanoprost and brimonidine: a therapeutic and physiologic assessment before and after oral nonstreoidal anti-inflammatory therapy. Am J Ophthalmol. 2002; 133: 11-18. **2.** Kashiwagi K, Tsukahara S: Effect of nonstreoidal anti-inflammatory ophthalmic solution on intraocular pressure reduction by latanoprost. Br J Ophthalmol. 2003; 87: 297-301. **3.** Woodward DF, Krauss AHP, Chen J, *et al*: The pharmacology of bimatoprost: Lumigan. Surv Ophthalmol. 2001; 45 (Suppl4): S337-S341. **4.** Parentin F: Granulomatous anterior uveitis caused by bimatoprost: a case report. Ocul Immunol Inflamm. 2003; 11: 67-71. **5.** Carillo MN, Nicolela MT: Cystoid macular edema in a low-risk patient after switching from latanoprost to bimatoprost. Am J Ophthalmol. 2004 137: 966-968. **6.** Packer M, Fine IH, Hoffman RS: Bilateral nongranulomatous anterior uveitis associated with bimatoprost. J Cataract Refract Surg 2003; 29:2224-2243. **7.** Wand M, Gaudio AR: Cystoid macular edema associated with ocular hypotensive lipids. Am J Ophthalmol. 2002; 133:403-405.

P213 DIURNAL INTRAOCULAR PRESSURE CONTROL AND TONOGRAPHIC OUTFLOW FACILITY WITH BIMATOPROST 0.03% *VERSUS* TIMOLOL 0.5% IN PATIENTS WITH EXFOLIATIVE GLAUCOMA

A.G.P. Konstas[1], C.H. Karabatsas[2], M. Kotoula[2], R.F. Brubaker[3], N. Georgiadis[1]
[1]AHEPA Hospital, Thessaloniki, Greece, [2]University Dept. Ophthalmology, Larissa, Greece, [3]Mayo Clinic, Rochester, MN, United States of America

Purpose: To evaluate the diurnal intraocular pressure (IOP) control and outflow effect of bimatoprost 0.03% once every evening *versus* timolol maleate 0.5% given twice daily to exfoliative glaucoma (XFG) patients.
Design: Single-masked, placebo-controlled, two center, one-year, parallel comparison.
Methods: Consecutive newly diagnosed, or suitably washed out XFG patients with no previous exposure to prostaglandins/prostamides, underwent a baseline untreated diurnal curve (08:00, 10:00, 16:00 and 20:00) and outflow coefficient assessment by Schiotz tonography (11:00-12:00). Patients were then randomized to either bimatoprost, or timolol and were followed for one year. Diurnal IOP and outflow facility were measured after 3, 6 and 12 months.
Results: Thirty-two XFG patients completed the study (17 on bimatoprost, 15 on timolol). There was no difference between treatment groups with regard to baseline characteristics. Both medications significantly reduced the IOP at all timepoints measured however, mean diurnal IOP for bimatoprost was significantly better than timolol after 3, 6 and 12 months of therapy. At the last day of therapy the mean diurnal IOP with bimatoprost was 17.0 ± 2.4 *vs* 18.7 ± 2.4 mm Hg for timolol (P=0.03). The difference in IOP reduction between treatments was 2,1 mm Hg. The most common side effect was conjunctival hyperaemia, which was more common with bimatoprost (35.3%; P=0.012). At baseline and after 3, 6 and 12 months of therapy there was no difference in tonographic C-values between bimatoprost and timolol. Furthermore, there was no difference between untreated and treated tonographic values.
Conclusion: This study indicates that diurnal IOP control is significantly better in XFG with bimatoprost than timolol. However, there was no detectable outflow effect with both medications in this secondary glaucoma.

P214 THE EFFECT OF LATANOPROST ON CENTRAL CORNEAL THICKNESS

G.D. Pappas[1], T. Kersy[1], J.K. Menon[1], M. Smith[2], F. Jazayery[2], A.P. Booth[3]
[1]Royal Eye Infirmary, Plymouth, United Kingdom, [3]Peninsula Medical School, Plymouth, United Kingdom

Introduction: The most common way of measuring the intraocular pressure in the human eye is with the use of Goldmann applanation tonometer[1]. One of the factors influencing the measured intraocular pressure is the central corneal thickness (CCT)[2].
Aim of the study: Latanoprost is a potent ocular hypotensive agent used in the treatment of glaucoma. A reduction in central corneal thickness (CCT) can lead to an under-estimation of intraocular pressure (IOP) by Goldman applanation tonometry and vice versa[2]. The aim of this study was to determine whether latanoprost has an effect on CCT.
Methods: Patients with newly diagnosed glaucoma, underwent measurement of CCT using ultrasound pachymeter (Model 885, Humphrey Systems Inc.) both immediately prior to the commencement of treatment with latanoprost 0.005% nocte (Pfizer Ltd) and after two months of latanoprost treatment. Patients were excluded if there was evidence of corneal pathology, previous corneal or intraocular surgery, or concurrent or recent (within three months) topical treatment. Statistical analysis was performed using the paired samples *t*-test.
Results: Fifty two eyes were assessed. The mean CCT prior to commencement of latanoprost treatment was 542.1 micm. The mean CCT after two months of treatment with latanoprost was 538.8micm. This was not a statistically significant difference.
Conclusion: Latanoprost does not cause a change in CCT after two months of topical treatment. This is in contrast to previous studies which have suggested that latanoprost does cause a statistically significant reduction in CCT[3,4]. The reduction in IOP caused by topical latanoprost is therefore a real reduction in IOP rather than an apparent reduction in IOP secondary to a change in CCT.
References:
1. Goldmann H, Schmidt T Uber applanationstonometrie. Ophthalmologica 1957;134:221-242

2. Doughty Mj, Zaman ML. Human Corneal Thickness and its impact on intraocular pressure measures: a review and meta-analysis approach. Surv Ophthalmol 2000;44:367-408 **3.** J D Brandt, J A Beiser, M O Gordon, M A Kass and the OHTS group. CCT and Measured IOP response to topical ocular hypotensive medication in the ocular hypertension treatment study. AJ Ohthalmol 2004;138:717-722. **4.** ARVO 2003: abstracts 4232, 4419

P215 CORNEAL EFFECTS OF PROSTAGLANDIN ANALOGUES – SIX MONTH RESULTS

V. Pathak-Ray, C. Kranemann, C. Birt, I. Ahmed, J. Flanagan
University of Toronto, Cardiff, United Kingdom

Objective: To determine if prostaglandin analogues (PA) have any effect on the cornea thereby influencing intraocular pressure (IOP).
Design: Prospective, randomised clinical study.
Participants/Controls: The criteria for inclusion were: all glaucoma patients above 15 years, those that were not already on a PA and whose glaucoma control required the commencement or addition of a topical medication. Contra lateral eye not requiring PA was included as control.
Methods: The IOP of each eye was measured by Goldmann aplanation tonometry (GAT). The IOP and corneal hysteresis (CH) was measured by the Ocular Response Analyser (ORA) non-contact tonometer with corneal response (NCTCR) (Reichert Ophthalmic Instruments, Buffalo, NY). These measurements were done at baseline, one month, two months and six months. In addition corneal pachymetry (CCT) was performed by Nidek ultrasound pachymeter at baseline two and six months. Paired student t-test SPSS version 11.5 was used for statistical analysis.
Main outcome measures: IOP, CH and CCT.
Results: The study included 74 eyes of 44 patients; of these there were 41 right and 33 left eyes. 54.5% of patients (n=24) were Caucasians, 22.7% (n=10) were black and 22.8% (n=10) were Asians. 14 patients were included as control. The mean baseline GAT was 21.27 mmHg (SD ±6.65). GAT at one month was 15.3 mmHg, (SD ±3.36) and at two months 16.39 mmHg, (SD ±5.29). Corneal thickness was found to be significantly reduced at two months (mean 533.87, SD ±39.68) following baseline (mean 542.02, ±SD 41.57) for the PA group (p<0.001), whereas corresponding values for controls was not significant (baseline 560.31, SD ±46.33, and at two months 553.31, SD ±51.23), p=0.071. Corneal hysteresis was significantly different for the PA group at one month (4.29, SD ±1.63) and at two months (4.65, SD ±2.38) when compared to baseline (5.29, SD ±2.0) (p<0.001 and p=0.006). Control subjects showed no difference (baseline 5.07, SD ±1.45; one month 5.76, SD ±1.94; two months 5.23, ±SD 2.1), (p=0.084 and p=0.627 respectively). All the above results were corroborated by readings at six months.
Conclusion: Prostaglandin analogues appear to cause thinning of the cornea and an increase in corneal hysteresis after two and six months of use.
References:
1. Doughty M, J., Zaman M, L., Human Corneal Thickness and Its Impact on Intraocular Pressure Measures: A Review and Meta-analysis Approach. Survey of Ophthalmology, 2000. 44(5): p. 367-408. **2.** Ehlers N, H.J., Corneal thickness: measurement and implications. Experimental Eye Research, 2004. 78: p. 543-548. **3.** Aghaian, E., *et al.*, Central corneal thickness of Caucasians, Chinese, Hispanics, Filipinos, African Americans, and Japanese in a glaucoma clinic. Ophthalmology, 2004. 111(12): p. 2211-9. **4.** Brandt, J.D., Beiser J. A., Kass M. A., Gordon M, O., and the Ocular Hypertension Treatment Study (OHTS) group, Central Corneal Thickness in the Ocular Hypertension Treatment Study (OHTS). Ophthalmology, 2001. 108(10): p. 1779-1788. **5.** Lass, J.H., *et al.*, Comparison of the corneal effects of latanoprost, fixed combination latanoprost-timolol, and timolol: A double-masked, randomized, one-year study. Ophthalmology, 2001. 108(2): p. 264-71. **6.** Shimmyo M, L.D., Corneal Hysteresis (Reichert ORA) by Age, Race and Sex of a Normal Clinical Population of 840 Eyes. 2004, IOVS e-abstracts: ARVO Ft Lauderdale, Florida. **7.** Viestenz, A., *et al.*, [Impact of prostaglandin-F(2alpha)-analogues and carbonic anhydrase inhibitors on central corneal thickness – a cross-sectional study on 403 eyes]. Klin Monatsbl Augenheilkd, 2004. 221(9): p. 753-6. **8.** Wickham, L., B. Edmunds, and I.E. Murdoch, Central corneal thickness: will one measurement suffice? Ophthalmology, 2005. 112(2): p. 225-8.

P216 EFFICACY AND SAFETY OF BIMATOPROST COMPARED TO TIMOLOL IN THE TREATMENT OF CHRONIC ANGLE-CLOSURE GLAUCOMA. THE BIMATOPROST CACG STUDY GROUP

A. Euswas, Y. Leelachaikul
Ramathibodi Hospital, Bangkok, Thailand

Purpose: Evaluate whether bimatoprost (LUMIGAN$ 0.03%) is clinically more successful in reducing IOP than timolol (0.5%).
Design: Prospective, double-masked, randomized, multi-centered (Thailand, the Philippines and India) 12-week treatment study.
Participants: Patients with chronic angle closure glaucoma (CACG).
Method: Patients received bimatoprost once daily (N=107) or timolol twice daily (N=105). Visits were at prestudy (washout period for previous glaucoma medications), baseline, weeks 2, 6 and 12. Investigators recorded IOP at 8am, 10am and 4pm. Main Outcomes: 1) Mean change in IOP at total, 8am, 10am and 4pm, 2) Clinical success, defined as a difference in IOP reduction of >1.5 mmHg with bimatoprost *versus* timolol, and 3) Safety.
Results: At 12 weeks: the mean changes [Last Observation Carried Forward, LOCF] from baseline of: Total IOP were -7.1 mmHg for bimatoprost and -4.6 mmHg for timolol (difference: -2.5 mmHg [95% confidence interval: -3.8, -1.2], P<0.0001), 8AM IOP were -7.2 mmHg for bimatoprost and -5.2 mmHg for timolol (difference: -2.0 mmHg [95% CI: -3.5, -0.6], P<0.0001), 10AM IOP were –7.1 mmHg for bimatoprost and –4.9 mmHg for timolol (difference:-2.2 [95% CI: -3.8, -0.7], P<0.0001) and 4PM IOP were -6.7 mmHg for bimatoprost and -3.7 mmHg for timolol (difference: -3.0 mmHg [95% CI: -4.5, -1.5], P<0.0001). Sixty six patients experienced adverse events, 30 and 36 in the bimatoprost and timolol treatment groups, respectively. Four patients in each group withdrew due to adverse events.
Conclusion: Bimatoprost and timolol were well tolerated. Bimatoprost administered once daily provided significantly greater IOP reduction in CACG patients than timolol administered twice daily. Bimatoprost provides an improved alternative to timolol in the treatment of patients with CACG.
References:
1. Congdon NG. Friedman DS. Angle-closure glaucoma: impact, etiology, diagnosis, and treatment. Curr Opin Ophthalmol 2003; 14: 70"3. **2.** Brandt JD, VanDenburgh AM, Chen K, *et al.* Comparison of once- or twice-daily bimatoprost with twice-daily timolol in patients with elevated IOP : a 3-month clinical trial. Ophthalmology 2001; 108: 1023-31. **3.** Whitcup SM, Cantor LB, VanDenburgh AM, Chen K. A randomised, double masked, multicentre clinical trial comparing bimatoprost and timolol for the treatment of glaucoma and ocular hypertension. Br J Ophthalmol 2003; 87: 57-62. **4.** Higginbotham EJ, Schuman JS, Goldberg I, *et al.* One-year, randomized study comparing bimatoprost and timolol in glaucoma and ocular hypertension. Arch Ophthalmol 2002; 120: 1286-93. **5.** Gandolfi S, Simmons ST, Sturm R *et al*, Bimatoprost Study. Three-month comparison of bimatoprost and latanoprost in patients with glaucoma and ocular hypertension. Adv Ther 2001; 18: 110"21. **6.** Agarwal HC, Gupta V, Sihota R. Effect of changing from concomitant timolol pilocarpine to bimatoprost monotherapy on ocular blood flow and IOP in primary chronic angle closure glaucoma. J Ocul Pharmacol Ther 2003; 19: 105"112.

P217 LONG-TERM IOP-LOWERING EFFICACY AND SAFETY OF BIMATOPROST IN GLAUCOMA AND OCULAR HYPERTENSION: BIMATOPROST PIVOTAL TRIAL RESULTS EXTENDED THROUGH YEAR 4

S.T. Simmons[1], R.L. Gross[2], E. Safyan[3], R. Liu[3]
[1]Glaucoma Consultants of Capital Region, Slingerlands, NY, United States of America, [2]Baylor College of Medicine, Houston, TX, United States of America, [3]Allergan, Inc., Irvine, CA, United States of America

Objective: Evaluate the long-term efficacy and safety of bimatoprost 0.03% QD compared with timolol 0.5% BID for reducing IOP.
Design: Multicenter, double-masked, randomized, parallel-group, comparison trial.
Participants: Patients (n = 152) who completed the extension of the phase III pivotal trials of bimatoprost *vs* timolol through 3 years[1,2,3,4] were enrolled in a final study extension through year 4.
Intervention: Patients initially randomized to bimatoprost QD or timolol BID received the same regimen through month 48. Patients initially randomized to bimatoprost BID were switched to bimatoprost QD (bimatoprost BID/QD group) at month 24.
Main outcome measures: IOP was measured at 8 AM and 10 AM at follow-up visits at months 39, 42, 45, and 48.
Results: Baseline IOP at 8 AM and 10 AM (measured on day 0 of the initial pivotal trials) was comparable among treatment groups. During the fourth year of treatment, bimatoprost QD and BID/QD provided significantly greater IOP reductions from baseline compared with timolol BID at all measurements. Differences between bimatoprost QD and timolol ranged from 1.9–3.3 mm Hg (P <= .010); differences between bimatoprost BID/QD and timolol ranged from 1.9–3.2 mm Hg (P <= .035). Only 2 patients discontinued from the study after month 36 due to adverse events and both were in the timolol treatment group.
Discussion: Bimatoprost continued to provide IOP lowering superior to that of timolol during the fourth year of treatment. Only expected side effects[5] were associated with long-term bimatoprost use.
Conclusions: Bimatoprost QD continued to be safe and provided sustained IOP lowering 2-3 mm Hg better than timolol BID through four years of continuous use, and no patients discontinued for adverse events during year 4.
References:
1. Sherwood M, *et al.* Six-month comparison of bimatoprost once-daily and twice-daily with timolol twice-daily in patients with elevated intraocular pressure. Surv Ophthalmol. 2001;45(Suppl 4):S361-S368. **2.** Higginbotham EJ, *et al.* One-year, randomized study comparing bimatoprost and timolol in glaucoma and ocular hypertension. Arch Ophthalmol. 2002;120:1286-1293. **3.** Cohen JS, *et al.* Two-year double-masked comparison of bimatoprost with timolol in patients with glaucoma or ocular hypertension. Surv Ophthalmol. 2004;49(Suppl 1):S45-S52. **4.** Cohen JS, Greff L. Efficacy and safety of long-term bimatoprost treatment in glaucoma and ocular hypertension. Presented at ARVO, April 25-29, 2004, Fort Lauderdale, FL. **5.** Cantor LB. An update on bimatoprost in glaucoma therapy. Expert Opin Pharmacother. 2002;3:1753-1762.

P218 BIMATOPROST-INDUCED PERIOCULAR HYPERPIGMENTATION: HISTOLOGIC FINDINGS AND POSSIBLE MECHANISMS

P. Edward, S. Osmanovic, R. Kapur, S Toyran
University of Illinois at Chicago, Chicago, IL, United States of America

Introduction: Periocular skin hyperpigmentation following topical prostaglandin use has been previously described. However, the pathologic findings and the possible mechanism of periocular hyperpigmentation have not been previously described.
Aim: To study the histopathologic changes in eyelid specimens from two patients who developed periocular skin hyperpigmentation following bimatoprost use and to utilize these findings to determine the possible mechanism/s underlying bimatoprost induced periocular hyperpigmentation.
Methods: Two eyelid biopsy specimens from bimatoprost-treated Caucasian patients with periocular hyperpigmentation and matched controls were processed and examined by light microscopy and transmission electron microscopy (TEM). Melanin granules were counted on Fontana-Masson stained sections. Ultrastructural findings were noted on TEM and melanin and cell counts were performed using an image analyzer. Also, immunohistochemistry was performed with antibodies against S-100, CD3 and CD 68; and the positively labeled cells were counted.
Results: By light microscopy, the epidermis and dermis of both bimatoprost-treated specimens and controls were unremarkable. No atypical melanocytes were evident. Approximately a 200-fold increase in melanin granules in the basal epidermis and a 4-fold increase in the dermis was noted in the bimatoprost-treated specimens when compared to the controls. TEM confirmed the approximately 200-fold increase in the number of melanosomes per keratinocyte and a 4-fold increase per dermal melanocyte were noted. In the keratinocytes the melanosomes were normal in size and appeared fully melanized in the patient specimens. However, the dermal melanocytes of the patient specimens demonstrated prominent intracytoplasmic organelles, abundant melanosomes that were normal in size but were in different stages of maturation. The dermal melanocytes in the control specimens mainly contained mature melanosomes. S-100 positive melanocyte counts were analogous in the patient and control group. Few CD3 positive T lymphocytes and CD 68 positive macrophages were noted in both the patient and control group.
Conclusion: To our knowledge this is the first study describing the pathologic skin changes in bimatoprost-induced periocular hyperpigmentation. The findings suggest that the hyperpigmentation results from increased melanogenesis in dermal melanocytes and increased transfer of melanin to basal keratinocytes. The mechanism of increased dermal melanogenesis bears some similarities to prostaglandin-induced melanogenesis in the skin following ultraviolet light exposure and also to the increased melanogenesis seen in iris melanocytes following prostaglandin use. There was no evidence of melanocyte proliferation or prostaglandin-induced inflammation in the specimens examined.
References:
1. Wand M, Ritch R, Isbey EK, Zimmerman TJ. Latanoprost and periocular skin color changes. Arch Ophthalmol. 2001;119:614-615 **2.** Seiberg M. Keratinocyte-melanocyte interactions during melanosome transfer. Pigment Cell Res. 2001;14:236-242 **3.** Gilchrest BA, Park H-Y, Eller MS, Yaar M. Mechanisms of ultraviolet light-induced pigmentation. Photochem Photobiol. 1996;63:1-10.

P219 COMPARATIVE EFFICACY AND SAFETY OF FIXED COMBINATIONS OF TRAVOPROST 0.004%/TIMOLOL 0.5% AND LATANOPROST 0.005%/TIMOLOL 0.5% IN PATIENTS WITH OPEN-ANGLE GLAUCOMA OR OCULAR HYPERTENSION: A 1-YEAR STUDY

J.M. Martínez de la Casa[1], H. Wieland[2], D. Wells[2], K. Sullivan[2]
[1]Hospital Clínico San Carlos, Madrid, Spain, [2]Alcon Inc., Freiburg, Germany

Introduction: In this randomized, double-masked, multicenter, parallel group, active-controlled study, 408 patients with open-angle glaucoma (OAG) or ocular hypertension (OH) were enrolled in 41 sites. 207 were randomized to the Travoprost 0.004%/Timolol 0.5% ophthalmic solution (Trav/Tim) group and 200 to the Latanoprost 0.005%Timolol 0.5% ophthalmic solution (Lat/Tim) group.
Aim of the study: The objective of the study was to compare the IOP-lowering efficacy and safety of once-daily Trav/Tim and once-daily Lat/Tim in patients with OAG or OH.
Methods: The study was conducted in compliance with the Declaration of Helsinki. All patients

were washed-out from their previous glaucoma medication(s). At the Eligibility Visit, the patients were randomized to the assigned masked medication if they were still meeting all the inclusion/exclusion criteria, and the mean IOP values in the same eye was ≥ 24 mmHg at 9AM and ≥ 21 mmHg at 11AM and 4PM. The mean IOP in either eye could not be > 36 mmHg. Patients were instructed to instill one drop of the assigned medication every morning at 9AM. The treatment phase included visits at Week 2, Week 6, Month 3, Month 6, Month 9 and Month 12. IOP was measured at 9 AM at Week 2, Week 6, Month 3 and Month 9, and at 9AM, 11AM and 4PM at the Month 6 and 12 visits.

Statistical methods: Repeated measures analysis of variance. For the test of non-inferiority, a 95% confidence interval for the treatment group difference was constructed based on the analysis of variance at each time point at Month 12 (per protocol data set). The primary efficacy parameter was mean IOP: primary efficacy was pre-specified for the Month 12 visit (non-inferiority of Trav/Tim to Lat/Tim). The safety analysis was based on the evaluation of the extent of exposure to study drug, a review of adverse events, and an analysis of ophthalmic and cardiovascular parameters.

Results: At baseline, no significant differences were observed between the treatment groups. Mean IOP values at baseline were (Trav/Tim *vs.* Lat/Tim) 27.1 *vs.* 27.1 mmHg at 9AM, 25.8 *vs.* 25.9 at 11AM and 24.6 *vs.* 25.0 at 4PM. From Week 2 to Month 12, Trav/Tim dosed once-daily in the morning maintained IOP similarly or better than Lat/Tim, dosed once-daily in the morning (per protocol analysis, n=332). Mean IOP was lower for Trav/Tim than for Lat/Tim at all study visits and all times, and Trav/Tim produced statistically significant lower mean IOPs than Lat/Tim (intent-to-treat, n=398) at the Week 2 9AM ($p \leq 0.01$) and at the Month 6 9AM ($p \leq 0.02$) visits. When pooled across all six 9 AM visits between Week 2 and Month 12, Trav/Tim produced statistically significant lower mean IOP results than Lat/Tim ($p \leq 0.03$). Both treatments produced significant IOP reduction from baseline. 407 patients were evaluable for safety. The most frequent adverse event related to treatment with Trav/Tim was ocular hyperaemia. An analysis of ophthalmic and cardiovascular parameters revealed no safety concerns.

Conclusions: Trav/Tim is an effective treatment for IOP-lowering and it is safe and well-tolerated in patients with OAG or OH.

References:

1. Camras CB. Mechanism of the prostaglandin-induced reduction of intraocular pressure in humans. Adv Prostaglandin Thromboxane Leukot Res. 1995;23:519-25. **2.** Shin DH, Feldman RM, Sheu W-P. Fixed Combination Latanorpost/Timolol Study Group. Efficacy and safety of the fixed combinations latanoprost/timolol *versus* dorzolamide/timolol in patients with elevated intraocular pressure. Ophthalmol. 2004;111:276-82. **3.** Kass MA, Heuer DK, Higginbotham EJ, Johnson CA, Keltner JL, Miller JP, *et al.* The Ocular Hypertension Treatment Study: A randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary-open angle glaucoma. Arch Ophthalmol. 2002;120:701-13. **4.** Higginbotham EJ, Diestelhorst M, Pfeiffer N, Rouland JF, Alm A. The efficacy and safety of unfixed and fixed combinations of latanoprost and other antiglaucoma medications. Surv Ophthalmol. 2002;47:S133-40.

P220 A 12-WEEK, RANDOMIZED, DOUBLE-MASKED MULTICENTER STUDY OF THE FIXED- COMBINATION LATANOPROST AND TIMOLOL IN THE EVENING *VS.* THE INDIVIDUAL COMPONENTS

L.-I. Larsson[1], M. Diestelhorst[2]
[1]Pfizer Inc., New York, United States of America, [2]University of Köln, Köln, Germany

Objective: To compare the efficacy and safety of the fixed-combination latanoprost and timolol applied in the evening with the concomitant use of individual components.

Design: Randomized, double-masked, multicenter study.

Participants: 502 patients with ocular hypertension, open-angle, pigmentary, or exfoliation glaucoma, and baseline (after washout) intraocular pressure (IOP) levels between 23 mmHg and 33 mmHg.

Methods: Patients received either the fixed combination (FC) of latanoprost and timolol once-daily in the evening and placebo in the morning and evening or the unfixed combination (uFC) of latanoprost once-daily in the evening and timolol morning and evening. Study visits were at weeks 2, 6, and 12.

Main outcome measures: The primary efficacy endpoint was mean change from baseline to week 12 in diurnal IOP (mean IOPs of 8 am, 12 noon, 4 pm). FC was considered non-inferior to uFC if the upper limit of the 95% confidence interval (CI) of the difference was <1.5 mmHg (ANCOVA). Adverse events (AEs) were recorded at each visit.

Results: Intent-to-treat analyses included 255 patients treated with the FC and 247 who received the uFC. In the FC and uFC groups, mean baseline diurnal IOPs were 25.4 mmHg and 25.2 mmHg, respectively. Mean reductions in diurnal IOPs from baseline to week 12 were 8.7 mmHg and 9.0 mmHg, respectively; the between-treatment difference was 0.3 mmHg (95% CI, -0.1 to 0.7 mmHg [P=0.15]), indicating the FC was non-inferior to the uFC. For those receiving FC and uFC at 12 weeks, 93% and 92%, respectively, had a >=20% reduction in mean diurnal IOP (P=0.58), while 76% and 74%, respectively, had mean diurnal IOP level <=18 mmHg (P=0.52). Both treatments were well tolerated and safe; <3% of patients in either group withdrew from the study due to an AE. The FC group had fewer treatment-emergent AEs, ocular AEs, or eye irritations.

Conclusions: The FC of latanoprost and timolol applied in the evening is non-inferior to the uFC of once nightly latanoprost and twice daily timolol. The FC provides a once-daily alternative to the three instillations needed with the individual components which may interfere with patient compliance.

References:

1. Alm A, *et al.* Ophthalmology 1995;102:1743–52. **2.** Diestelhorst M, Almegard B. Graefes Arch Clin Exp Ophthalmol 1998;236:577–81. **3.** Diestelhorst M, *et al.* Br J Ophthalmol 2004;88:199–203. **4.** Higginbotham EJ, *et al.* Arch Ophthalmol 2002;120:915–22. **5.** Konstas AG, *et al.* Am J Ophthalmol 1999;128:15–20. **6.** Konstas AG, *et al.* Am J Ophthalmol 2002;133:753–7. **7.** Pfeiffer N. Graefes Arch Clin Exp Ophthalmol 2002;240:893–9.

P221 COMPARISON OF SIDE EFFECTS OF TOPICAL TRAVOPROST AND BIMATOPROST

G. Alagöz[1], A. Bayer[2], Ç. Boran[1], D. Serin[1], A. Kükner[1], M.N. Elçioglu[1]
[1]Abant Izzet Baysal Uni.I.B.Medical Fac., Bolu, Turkey, [2]Gülhane Military Med. Academy, Ankara, Turkey

Introduction: The conjunctiva is a living tissue and may respond to topical medication with inflammation, scarring, keratinization and neovascularization. Topical therapy may cause discomfort and adverse effect on the tear film and mucus production.

Purpose: To compare the tearing response and conjunctival changes secondary to topical administration of bimatoprost and travoprost for 6 months.

Design: The study was designed as a case-controlled, non-randomized clinical trial.

Participants: Newly diagnosed POAG patients who were not treated before were enrolled in the study. They were randomly prescribed bimatoprost (36 cases) or travoprost (46 cases).

Method: Physician I made the diagnosis and prescribed the drug. Physician II performed the follow-up. A pathologist examined the cytology specimens.

Main outcome measures: Redness, itching, foreign body sensation, pain, and discomfort were asked in an ocular questionnaire and patients were examined for conjunctival hyperemia (scored 0-3). Schirmer I and Break-up Time (BUT) tests were performed and impression cytology of conjunctiva was evaluated(graded 0-3) according to the technique described by Nelson *et al*[1].

Results: Subjective symptoms and objective examination findings were found to have increased with time. The findings were similar in both groups. Mean values of Schirmer I test were different in days 90 and 180 in bimatoprost but not in travoprost group. There was no significance between both groups. But it did not change with time and was demonstrated to be completely similar in both groups throughout the follow-up. Grading of impression cytology increased with time in both groups. The only significant difference between groups was on day 90; grading was higher in bimatoprost group.

Conclusion: Because the difference in all parameters between drugs were similar except in impression cytology grading on day 90, we can speculate that both drugs have similar adverse effects. Local side effects of antiglaucomatous drugs may lower the compliance of the patient, success of subsequent filtrating surgery[2,3], and may cause some other additional pathologies such as dry eye. To minimize the ocular surface side effects of topical drugs, the number of drugs and drops should be minimized.[4,5]. Because bimatoprost and travoprost are effective drugs and require low posology, there seems to be an appropriate choice for the treatment of glaucoma..

References:

1. Nelson JD, Havener VR, Cameron JD. Cellulose acetate impressions of the ocular surface, dry eye states. Arch Ophthalmol 1983; 101:1869-1872. **2.** Lavin MJ, Wormald RPL, Migdal CS, Hitchings RA. The influence of prior therapy on the success of trabeculectomy. Arch Ophthalmol 1990;108:1543– 8. **3.** Broadway DC, Grierson I, O'Brien C, Hitchings RA. Adverse effects of topical antiglaucoma medication. II. The outcome of filtration surgery. Arch Ophthalmol 1994;112: 1446 –54. **4.** Nuzzi R, Vercelli A, Finazzo C, Cracco C. Conjunctiva and subconjunc¬tival tissue in primary open-angle glau¬coma after long-term topical treatment: an immunohistochemical and ultra¬structural study. Graefes Arch Clin Exp Ophthalmol 1995; 233:154-162 **5.** Sherwood MB, Grierson I, Millar L, Hitchings RA. Long-term mor¬phologic effects of antiglaucoma drugs on the conjunctiva and Tenon's capsule in glaucomatous patients. Ophthalmol¬ogy1989; 96:327-335

P222 A COMPARATIVE STUDY OF BIMATOPROST AND TRAVOPROST: EFFECT ON INTRAOCULAR PRESSURE AND OCULAR CIRCULATION IN NEWLY DIAGNOSED GLAUCOMA PATIENTS

G. Alagöz[1], K. Gürel[1], A. Bayer[2], D. Serin[1], S. Çelebi[1], A.S. Kükner[1]
[1]Abant Izzet Baysal Uni.I.B.Medical Fac., Bolu, Turkey, [2]Gülhane Military Med. Academy, Ankara, Turkey

Introduction: Although elevated IOP is the best known and most important causative factor, several lines of evidence suggest that glaucoma is a multifactorial disease involving alterations in ocular blood flow[1].

Purpose: To evaluate the IOP lowering efficacy of bimatoprost compared with travoprost, and the impact of topical bimatoprost and travoprost on retrobulbar hemodynamics in newly diagnosed open angle glaucoma (OAG) patients.

Design: The study was designed as a case-controlled, non-randomized clinical trial.

Participants: Eighty two primary open angle glaucoma patients were enrolled in the study (36 in bimatoprost group, 46 in travoprost group). All patients were newly diagnosed and free of ocular medication at the time of enrollment.

Method: Physician I made the glaucoma diagnosis and selected the cases that are eligible for the study, and prescribed the drugs (bimatoprost or travoprost) in an alternating order. Physician II made the ophthalmic examination and intraocular pressure (IOP) measurements. Sonographer measured the retrobulbar circulation with Doppler imaging (CDI) which is a non-invasive, painless, and highly reproducible technique[1,2].

Main outcome measures: IOP measurements were done with Goldmann applanation tonometer. Flow velocities in the central retinal artery (CRA), central retinal vein (CRV), posterior ciliary artery (PCA), and ophthalmic artery (OA) were determined with CDI. Peak-systolic velocity (PSV), end-diastolic velocity (EDV), and resistivity index (RI) values were obtained for each vessel. These examinations were repeated on days 30, 90 and 180.

Results: Mean pre-treatment IOP did not differ between the groups($p>0.05$). Both bimatoprost and travoprost lowered baseline IOP significantly on days 30, 90 and 180($p<0.05$). It was observed that bimatoprost lowered IOP slightly more than travoprost on all follow-up visits, but not significantly. EDV of CRA on day 180 was higher than the value obtained at baseline in both groups. All other CDI measurements were unaffected by administration of either bimatoprost or travoprost($p>0.05$).

Conclusion: Our study supports the fact that bimatoprost[3,4] and travoprost[5] provide effective IOP lowering in patients with glaucoma. Both drugs also result in improvement in the CRA blood flow. These findings suggest that bimatoprost and travoprost are an appropriate therapeutic choice for IOP lowering in glaucoma patients.

References:

1. Bergstrand IC., Heijl A, Wollmer P, Hansen F and Haris A. Timolol increased retrobulbar flow velocities in untreated glaucoma eyes but not in ocular hypertension. Acta Ophthalmol. Scand. 2001; 79: 455–461 **2.** Baxter GM, Williamson TH. Color Doppler imaging of the eye: normal ranges, reproducibility, and observer variation. J Ultrasound Med (1995);14: 9196. **3.** Christiansen GA, Nau CB, McLaren JW, Johnson DH. Mechanism of ocular hypotensive action of bimatoprost (Lumigan) in patients with ocular hypertension or glaucoma. Ophthalmology. 2004 Sep;111(9): 1658-62. **4.** Quinones R, Severin T, Mundorf T. Efficacy of bimatoprost 0.03 percent in untreated glaucoma and ocularhypertension patients: results from a large community-based clinical trial. J Ocul Pharmacol Ther. 2004 Apr;20(2):115-22. **5.** Przydryga JT, Egloff C. Intraocular pressure lowering efficacy of travoprost. Eur J Ophthalmol. 2004 Sep-Oct;14(5):416-22.

P223 USE OF BIMATOPROST AND LATANOPROST IN CLINICAL PRACTICE

W.C. Stewart, J.N. Jenkins, J.A. Stewart
Pharmaceutical Research Network, LLC, Charleston, United States of America

Purpose: To evaluate differences in perception of bimatoprost *versus* latanoprost use.

Design: A randomly distributed survey to ophthalmologists in the United States.

Participants: Sixty-three physicians were included from 25 randomly chosen states.

Methods: This survey was sent to 500 physicians that listed their fax number in the American Academy of Ophthalmology membership directory. If a physician did not respond within two weeks a second query was sent.

Main outcomes measures: Survey with a multiple choice selection format.

Results: Physicians indicated they prescribed latanoprost more than bimatoprost in patients with primary open-angle glaucoma (POAG) (56 *versus* 23%) or ocular hypertension (OHT) (47 *versus* 15%) and as initial therapy (60 *versus* 20%) ($P < 0.001$). Physicians stated that 7% of latanoprost and 15% of bimatoprost therapy was discontinued by the first follow-up visit ($P = 0.001$). The primary reason for discontinuing latanoprost was perceived insufficient efficacy (28 *versus* 12%, $P < 0.001$) and bimatoprost was an adverse event (43 *versus* 22%, $P < 0.001$). Specifically, ocular hyperemia, periocular pigmentation, irritation and itching were more common with bimatoprost ($P < 0.05$). Additionally, a trend existed of more bimatoprost discontinuation from noncompliance (4.1 *versus* 1.8%, $P = 0.06$). When asked in approximately what percentage of patients did the physicians observe cosmetic defects, 22% noted periocular pigmentation with bimatoprost *versus* 11% with latanoprost ($P = 0.004$). In contrast, 38% noted conjunctival hyperemia with bimatoprost *versus* 15% with latanoprost ($P < 0.001$). Patients on bimatoprost also noted more: ocular hyperemia (24 versus 11%, $P = 0.002$), periocular pigmentation (12 *versus* 5%, $P = 0.008$) and symptoms when hyperemia was present (27 *versus* 17%, $P = 0.003$). Further, both physicians ($P = 0.01$) and office staff ($P = 0.02$) spent more office time counseling patients regarding bimatoprost side effects than latanoprost.

Conclusion: Both latanoprost and bimatoprost are proven efficacious, once-daily medications for the treatment of OHT and POAG. Because of the favorable efficacy profile of these medi-

cations other differences may help physicians chose between them such as: adverse events, cosmesis, compliance or counseling time. This survey shows that physicians perceive differences in side effects, cosmesis and time required for counseling patients between bimatoprost and latanoprost treatment.

References:

1. Day DG, Schacknow PN, Sharpe ED, *et al.* A persistency and economic analysis of latanoprost, bimatoprost, or beta-blockers in patients with open-angle glaucoma or ocular hypertension. J Ocul Pharmacol Ther 2004;20:383-92. **2.** Konstas AGP, Katsimbris JM, Lallos N, Boukaras GP, Jenkins JN, Stewart WC. Latanoprost 0.005% *versus* bimatoprost 0.03% in primary open-angle glaucoma patients. Ophthalmology 2004; in press. **3.** Parrish RK, Palmberg P, Sheu WP, *et al.* A comparison of latanoprost, bimatoprost, and travoprost in patients with elevated intraocular pressure: a 12-week, randomized, masked-evaluator multicenter study. Am J Ophthalmol 2003;135:688-703. **4.** Stewart WC, Rhodes JS, Leech JN. Survey Assesses Red Eye and Prostaglandin Use. Review Ophthalmol 2002 Apr:72-73. **5.** Stewart WC, Kolker AE, Stewart JA, Leech J, Jackson AL. Conjunctival hyperemia in healthy subjects after short-term dosing with latanoprost, bimatoprost, and travoprost. Am J Ophthalmol 2003;135:314-20.

P224 PHYSICIAN ASSESSMENT OF EFFICACY, TOLERABILITY AND PATIENT SATISFACTION WITH LATANOPROST 0.005% TREATMENT IN OCULAR HYPOTENSIVE PATIENTS

J. Bacharach[1], J.W. Ditkoff[2], D.L. Hartzell[3], C.L. Passmore[4], J.A. Stewart[4], W.C. Stewart[4]
[1]North Bay Eye Associates, Petaluma, United States of America, [2]Eye Care Center of New Jersey, Bloomfield, NJ, United States of America, [3]Hartzell Eye Care, Mechanicsburg, United States of America, [4]Pharmaceutical Research, Charleston, United States of America

Purpose: This study evaluated physician assessment of therapeutic efficacy, tolerability and patient satisfaction with latanoprost specifically in OHT patients.
Design: This was a prospective, open-labeled, non-controlled cohort.
Participants: The participants were OHT patients who were treated with latanoprost.
Methods: Data was collected from a two-year observational study of OHT patients in the United States.
Main outcome measures: Intraocular pressure and physician treatment ratings.
Results: There were 1216 patients enrolled into the study. At Visit 1 the intraocular pressure on a variety of treatments was 19.9 ± 4.7 mm Hg. After prescribing latanoprost the treatment IOP was: 18.2 ± 3.8 mm Hg at Visit 2 (n = 898); 18.3 ± 3.7 mm Hg at Visit 3 (n = 583); 18.6 ± 4.0 mm Hg at Visit 4 (n = 26); and 18.6 ± 4.1 mm Hg at Visit 5 (n = 107). While all patients were treated with latanoprost during the study, 19 (1.6%) were also treated with a beta-blocker: 44 (3.6%) with brimonidine; 16 (1.3%) with a topical CAI; and 46 (3.8%) with other glaucoma treatments. The physician survey results are shown in the table.
Conclusion: Physician assessment of OHT patients suggests that latanoprost generally provides at least excellent short-term efficacy, tolerability and patient satisfaction. Prescribing an efficacious, well tolerated medication, such as latanoprost given once daily, may be an acceptable way to initiate therapy in OHT because such patients are being treated preventively and are generally without disease related symptoms.

References:

1. Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714-20. **2.** Watson PG. Latanoprost. Two years' experience of its use in the United Kingdom. Latanoprost Study Group. Ophthalmology 1998;105:82-7. **3.** Day DG, Schacknow PN, Sharpe ED, *et al.* A persistency and economic analysis of latanoprost, bimatoprost, or beta-blockers in patients with open-angle glaucoma or ocular hypertension. J Ocul Pharmacol Ther 2004;20:383-92. **4.** Alm A, Schoenfelder J, McDermott J. A 5-year, multicenter, open-label, safety study of adjunctive latanoprost therapy for glaucoma. Arch Ophthalmol 2004;122:957-65. **5.** Diestelhorst M, Schaefer CP, Beusterien KM, *et al.* Persistency and clinical outcomes associated with latanoprost and beta-blocker monotherapy: evidence from a European retrospective cohort study. Eur J Ophthalmol 2003;13 Suppl 4:S21-9.

P225 CONSISTENCY OF INTRAOCULAR PRESSURE RESPONSE WITH LATANOPROST IN OCULAR HYPOTENSIVE PATIENTS

J. Bacharach[1], J.W. Ditkoff[2], D.L. Hartzell[3], C.L. Passmore[4], J.A. Stewart[4], W.C. Stewart[4]
[1]North Bay Eye Associates, Petaluma, United States of America, [2]Eye Care Center of New Jersey, Bloomfield, NJ, United States of America, [3]Hartzell Eye Care, Mechanicsburg, United States of America, [4]Pharmaceutical Research, Charleston, United States of America

Purpose: Because little data exist specifically that examine the effect of individual medications in ocular hypertension (OHT), we evaluated in patients with this disorder the consistency of the therapeutic response over time with latanoprost.
Design: Prospective, observational, two-year follow-up study.
Participants: The participants were OHT patients treated with latanoprost.
Methods: We evaluated the patients to determine the consistency of the intraocular pressure (IOP) levels over the first year of latanoprost therapy. Most patients were treated with latanoprost monotherapy after Visit 1, although a minority used this prostaglandin analog adjunctively. Patients could have been previously treated with any medicine, including latanoprost, or combination of medicines up to and including Visit 1. Visits occurred approximately every 3-4 months.
Main outcomes measures: The Main outcome measure was intraocular pressure.
Results: Of the 1216 OHT patients entered into the registry to date: 1044 (84.9%) were above 50 years of age; 957 (78.7%) were Caucasian, 174 (14.3%) were African American, 85 (7.0%) were of other race; and 711 (58.5%) were female 505 were male (41.5%). The intraocular pressure (IOP) results are shown in the figure. Each visit corresponds to 3-4 months of follow-up for a total time interval of just over a year. The range of mean IOP over the year was 18.2 to 18.6 mm Hg.
Conclusions: This study suggests OHT patients treated with latanoprost monotherapy have a persistent IOP maintenance for at least one year following initiation of therapy.

References:

1. Gordon MO, Beiser JA, Brandt JD, *et al.* The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714-20. **2.** Watson PG. Latanoprost. Two years' experience of its use in the United Kingdom. Latanoprost Study Group. Ophthalmology 1998;105:82-7. **3.** Day DG, Schacknow PN, Sharpe ED, *et al.* A persistency and economic analysis of latanoprost, bimatoprost, or beta-blockers in patients with open-angle glaucoma or ocular hypertension. J Ocul Pharmacol Ther 2004;20:383-92. **4.** Alm A, Schoenfelder J, McDermott J. A 5-year, multicenter, open-label, safety study of adjunctive latanoprost therapy for glaucoma. Arch Ophthalmol 2004;122:957-65. **5.** Diestelhorst M, Schaefer CP, Beusterien KM, *et al.* Persistency and clinical outcomes associated with latanoprost and beta-blocker monotherapy: evidence from a European retrospective cohort study. Eur J Ophthalmol 2003;13 Suppl 4:S21-9.

P226 EFFICACY AND SAFETY OF LATANOPROST 0.005% *VERSUS* TIMOLOL MALEATE 0.5% GEL FORMING SOLUTION EACH GIVEN ONCE EVERY EVENING IN PRIMARY OPEN-ANGLE GLAUCOMA OR OCULAR HYPERTENSION

M.T. Nicolela[1], P. Harasymowycz[2], C.M.L. Hutnik[3], W.C. Stewart[4]
[1]Dalhousie University, Halifax, Canada, [2]Maisonneuve-Rosemont Hospital, Montréal, Canada, [3]Ivey Eye Institute, London, Canada, [4]Pharmaceutical Research, Charleston, United States of America

Purpose: To compare the efficacy and safety of latanoprost and timolol gel forming solution (GFS).
Design: This was a randomized, crossover, investigator-masked, active-control study.
Participants: The participants were primary open-angle glaucoma and ocular hypertensive patients.
Methods: Patients received either once-daily 0.5% timolol GFS (n = 40) or once daily 0.005% latanoprost (n = 35) for 8 weeks (Period 1). Patients were then crossed over to the other medication and treated for another 8 weeks (Period 2). Intraocular pressure (IOP) was determined every 2 hours from 8:00 to 20:00 at baseline, and Weeks 8 and 16.
Main outcomes measures: The Main outcome measures are intraocular pressure and adverse events.
Results: During Period 1, the reduction in mean diurnal IOP in latanoprost-treated patients was significantly greater than in timolol GFS-treated patients (-6.9 ± 3.0 mm Hg and -5.5 ± 2.4 mm Hg respectively, P = 0.034). There was also a significant reduction from baseline in IOP after switching from timolol GFS to latanoprost (P < 0.001), not observed when patients were switched from latanoprost to timolol GFS. Latanoprost reduced IOP more than timolol GFS after combining each drug's treatment periods between treatment arms (-6.9 ± 2.9 mm Hg and -6.2 ± 2.7 mm Hg respectively, P = 0.018). The most common adverse events in both treatment groups were hyperemia (44%), blepharitis (17%) and erythema (11%). Four patients withdrew early, two for potential drug related events, one on latanoprost had conjunctival erythema and one on timolol GFS had increased heart rate and blood pressure.
Conclusion: Latanoprost is more effective than timolol GFS in reducing IOP and patients switched from timolol GFS to latanoprost have a further significant reduction in IOP.

References:

1. Camras CB. Comparison of latanoprost and timolol in subjects with ocular hypertension and glaucoma: A six-month, masked, multicenter trial in the United States. Ophthalmology 1996; 103:138-47. **2.** Shedden A, Laurence J, Tipping R. Efficacy and tolerability of timolol maleate ophthalmic gel-forming solution *versus* timolol ophthalmic solution in adults with open-angle glaucoma or ocular hypertension: a six-month, double-masked, multicenter study. Clin Ther 2001;23:440-50. **3.** Stewart WC, Leland TM, Cate EA, Stewart JA. Efficacy and safety of timolol solution once daily *vs.* Timolol gel in treating elevated IOP. J Glaucoma 1998;7:402-7. **4.** Larsson L-I. Intraocular Pressure over 24 Hours After Repeated Administration of Latanoprost 0.005% or Timolol Gel-forming Solution 0.5% in Subjects with Ocular Hypertension. Ophthalmology 2001;108:1439-44. **5.** Stewart WC, Day DG, Sharpe ED, *et al.* Efficacy and safety of timolol solution once daily *vs* timolol gel added to latanoprost. Am J Ophthalmol 1999;128:692-96.

P227 CLINICAL EXPERIENCE IN THE TREATMENT OF NORMAL TENSION GLAUCOMA WITH LATANOPROST IN GERMANY

U. Thelen[1], G. Lippitz[2], W.C. Stewart[3]
[1]Augenarztpraxis, Munster, Germany, [2]Private, Hoyerswerda, Germany, [3]Pharmaceutical Research, Charleston, United States of America

Purpose: The purpose of this analysis was to evaluate the general ophthalmologist's experience in using latanoprost to treat normal tension glaucoma (NTG) patients.
Design: This was a large, mid-term follow-up, observational study.
Participants: This analysis included 200 NTG patients treated with latanoprost.
Methods: This was a sub-analysis from a study based in the offices of 352 private German ophthalmologists who collected efficacy, safety, tolerability and satisfaction data in 17,576 treated ocular hypertension or glaucoma patients. This type of study is legally classified in Germany ('Anwendungsbeobachtung') as a method to collect observational data to help understand clinical outcomes.
Main outcomes measures: Intraocular pressure, discontinuation of therapy, adverse events and physician ratings of efficacy, tolerability and satisfaction.
Results: Patients were being treated already with latanoprost monotherapy (average duration, 1.2 ± 1.4 years). In addition, they must have had at least six months of follow-up during the registry (average follow-up, 1.8 ± 1.0 years) on latanoprost monotherapy. The patient sample included 121 females (60.5%) and 79 males (39.5%). The average age was 68.0 ± 11.1 years. At the beginning of the observation period patients had an average IOP of 15.2 ± 2.5 mm Hg and after six months 15.0 ± 2.4 mm Hg (P = 0.445). The physician assessments of efficacy, tolerability and patient satisfaction are shown in the table. Eight patients (4.0%) were discontinued from latanoprost during the observation period. The most common reason noted was the need for further IOP reduction (n = 7, 3.5%). Twenty-four patients (12.0%) noted an ocular adverse event during the observation period. The most common reason was burning/stinging (n = 9, 4.5%) or conjunctival hyperemia (n = 9, 4.5%).
Conclusions: The study indicates that patients with NTG, already treated with latanoprost monotherapy, should continue to have over the short-term follow-up generally stable IOPs, low incidence of side effects and discontinuations as well as 'very good' to 'excellent' physicians ratings of patient efficacy, tolerability and patient satisfaction.

References:

1. McKibbin M, Menage MJ. The effect of once-daily latanoprost on intraocular pressure and pulsatile ocular blood flow in normal tension glaucoma. Eye 1999;13:31-4. **2.** Rulo AH, Greve EL, Geijssen HC, Hoyng PF. Reduction of intraocular pressure with treatment of latanoprost once daily in patients with normal-pressure glaucoma. Ophthalmology 1996;103:1276-82. **3.** Kjellgren D, Douglas G, Mikelberg FS, Drance SM, Alm A. The short-time effect of latanoprost on the intraocular pressure in normal pressure glaucoma. Acta Ophthalmol Scand 1995;73:233-6. **4.** Ang A, Reddy MA, Shepstone L, Broadway DC. Long term effect of latanoprost on intraocular pressure in normal tension glaucoma. Br J Ophthalmol 2004;88:630-4. **5.** Day DG, Schacknow PN, Sharpe ED, *et al.* A persistency and economic analysis of latanoprost, bimatoprost or beta-blockers in patients with open-angle glaucoma or ocular hypertension. J Ocular Pharmacol Ther 2004;20:383-92.

P228 PHYSICIAN EXPERIENCE IN THE TREATMENT OF OCULAR HYPERTENSION WITH LATANOPROST IN GERMANY

U. Thelen[1], W. Lieschke[2], U. Borchart[2], T. Windisch[2], W.C. Stewart[3]
[1]Augenarztpraxis, Munster, Germany, [2]Private, Leipzig, Germany, [3]Pharmaceutical Research, Charleston, United States of America

Purpose: To evaluate the continued efficacy, safety and discontinuation rates in patients with ocular hypertension (OHT) treated with latanoprost in Germany.
Design: A prospective, longitudinal observational study of OHT and glaucoma patients treated with various ocular hypotensive medications.
Participants: The participants were OHT patients treated with latanoprost in Germany.
Methods: A sub-analysis of OHT patients that were previously treated on latanoprost monotherapy and continued within the study on this same medication for at least six months.
Main outcomes measures: Intraocular pressure, adverse events, discontinuation of therapy and physician ratings of efficacy, tolerability and satisfaction.
Results: 353 OHT patients were included in this sub-analysis. Patients were treated with latanoprost monotherapy historically (1.4 ± 1.3 years) and within the observational period of the study for a mean of 2.2 ± 1.1 years. On latanoprost only, the average intraocular pressure (IOP) at entry was 18.4 ± 2.7 mm Hg and after six months, the IOP was 18.1 ± 2.5 mm Hg (P = 0.11). During the observational period the most common ocular side effect was conjunctival

hyperemia (n = 73, 20.7%) and the most common systemic side effect was fatigue (n = 11, 3.1%). Nineteen patients (5.4%) discontinued latanoprost with the most common reason being insufficient efficacy (n = 11, 3.1%). Physician assessments of latanoprost monotherapy were 'very good' to 'excellent' for patient efficacy (n = 265, 75.2%), tolerability (n = 295, 83.8%) and patient satisfaction (n = 289, 82.1%).

Conclusions: The study suggests that OHT patients already treated with latanoprost monotherapy will continue to have, on average, at least mid-term stable pressures, low incidence of side effects and discontinuations and 'very good' to 'excellent' physician ratings of efficacy, tolerability and patient satisfaction.

References:

1. Gordon MO, Beiser JA, Brandt JD, *et al*. The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. Arch Ophthalmol 2002;120:714-20. **2.** Camras CB. Comparison of latanoprost and timolol in patients with ocular hypertension and glaucoma: a six-month masked, multicenter trial in the United States. The United States Latanoprost Study Group. Ophthalmology 1996;103:138-47. **3.** Parrish RK, Palmberg P, Sheu WP, *et al*. A comparison of latanoprost, bimatoprost, and travoprost in patients with elevated intraocular pressure: a 12-week, randomized, masked-evaluator multicenter study. Am J Ophthalmol 2003;135:688-703. **4.** Day DG, Schacknow PN, Sharpe ED, *et al*. A persistency and economic analysis of latanoprost, bimatoprost, or beta-blockers in patients with open-angle glaucoma or ocular hypertension. J Ocul Pharmacol Ther 2004;20:383-92. **5.** Diestelhorst M, Schaefer CP, Beusterien KM, *et al*. Persistency and clinical outcomes associated with latanoprost and beta-blocker monotherapy: evidence from a European retrospective cohort study. Eur J Ophthalmol 2003;13 Suppl 4:S21-9.

P229 CLINICAL CHARACTERISTICS OF BIMATOPROST-INDUCED PERIOCULAR SKIN HYPERPIGMENTATION IN CAUCASIANS

S. Osmanovic[1], D.P. Edward[2], M. Doshi[2]
[1]University of Illinois at Chicago, Arlington Heights, IL, United States of America, [2]University of Illinois Chicago, Chicago, IL, United States of America

Introduction: Clinical and histopathologic characteristics of prostaglandin-induced iris hyperpigmentation have been thoroughly investigated. There are, however, only isolated case reports of periocular skin hyperpigmentation from prostaglandin use.

Aim: To describe the clinical and demographic characteristics of bimatoprost-induced periocular skin hyperpigmentation in a large series of Caucasians.

Methods: Thirty six Caucasian patients (28 female, 8 male) with primary open angle glaucoma (n=27) or ocular hypertension (n=9) being treated with bimatoprost subsequently developed periocular skin hyperpigmentation that was cosmetically disturbing. An unbiased examiner performed a retrospective chart review of these patients. Baseline demographic data and clinical data concerning the periocular pigmentation were collected. These included age, gender, topical ocular medications used in conjunction with bimatoprost therapy, interval between initiation of bimatoprost therapy and the onset of pigmentation, intraocular pressure at initiation and discontinuation of bimatoprost therapy, grade of pigmentation at initial appearance and on discontinuation of bimatoprost, interval between discontinuation of bimatoprost and complete resolution of pigmentation, topical ocular medications that were started after discontinuing bimatoprost, grade of pigmentation at subsequent follow up visits after discontinuation of bimatoprost. The periocular pigmentation was graded using an arbitrary scale from 0 to 3. Quantitative analysis to determine associations between bimatoprost–induced pigmentation and baseline demographic and clinical data was performed using the Mann Whitney test and simple regression analysis. The associations analyzed included length of time to appearance of the pigmentation, time to pigment resolution, and differences between patients with complete and partial resolution of periocular pigmentation.

Results: Patients presented with variable grades of periocular hyperpigmentation (mean 1.39 ±0.61; range 1-3+) preceded by skin erythema and associated with hypertrichosis and periocular lanugo hair changes. Bimatoprost-induced periocular pigmentation appeared most frequently between three and nine months after initiation of bimatoprost therapy (270 ±142 days). Bimatoprost was discontinued after 324 ±172 days of treatment. Resolution of skin pigmentation was most frequent between 3 and 6 months (194 ± 100 days; range 61-472 days). There were 30 patients who had complete resolution of the periocular pigmentation, but six patients who had comparable follow up had incomplete resolution of the pigmentation. In four patients who continued bimatoprost use despite noticeable pigmentation had worsening of pigmentation grade on follow up. None of the baseline demographic or clinical parameters studied appeared to significantly influence number of days to onset of pigmentation or number of days to complete resolution of the pigmentation. Furthermore, no significant difference was noted in the baseline clinical parameters between patients with partial or complete resolution of pigmentation. In small group of patients that were switched to latanoprost or travoprost (n=11) initial pigment resolution occurred at the same rate as in those without prostaglandin treatment.

Conclusions: Topical bimatoprost use is associated with periocular skin hyperpigmentation in Caucasians with variable time of onset. The periocular hyperpigmentation is completely reversible in most patients upon washout. The rate of resolution is slow but variable. None of the baseline demographic or clinical characteristics tested significantly affected the rate of onset or resolution of bimatoprost induced skin hyperpigmentation.

P230 INTRAOCULAR PRESSURE REDUCING EFFECT OF LATANOPROST RELATED TO TRABECULAR OUTFLOW IN CHRONIC ANGLE CLOSURE GLAUCOMA

Y.B Liang, N.L. Wang, L.Y. Qiao
Beijing Tongren Eye Center, Beijing, China

Objective: To investigate if trabecular outflow was a route of latanoprost besides uveoscleral pathway.

Design: Prospective, cohort ,short-term study.

Participants *or control*: Twenty eyes of 17 patients with advanced chronic primary angle-closure glaucoma. According to the angle status with dynamic gonioscopy, patients were recruited into two cohorts: those angle total synechia closure (AC) and those in whom the ciliary body face in anterior chamber had synechia closure but partial functional trabecular meshwork could be seen (uveosclera pathway closure group, UC).

Intervention: 0.005%latanoprost was started in all subjects in addition to their previous medication after the baseline IOP was obtained. IOP were tested with Goldmann applanation tonometer from the fouth day to 10th day after treatment..

Main outcome measures: IOP , the reduction amplitude of IOP.

Results: Twenty eyes of17 patients completed this study. In AC group (n=10), the baseline IOP was 34.08 ± 11.10mmHg, endpoint IOP was 39.96 ± 14.53 mmHg, increased from the baseline by5.88 ± 8.11mmHg•it=2.295,p=0.047), while in UC Group (n=10). Dramatically IOP reduction was found in ten eyes, the baseline IOP was 33.79 ± 7.25mmHg, endpoint IOP was 22.67 ± 7.01mmHg , decreased from the baseline by 11.13 ± 11.06mmHg (t=3.182,p=0.011); One eye in AC group was seen with conjunctival congestion and sustained a remarkable IOP increase. (figure 1.)

Conclusions: In complete angle closure eyes, there appears to be no IOP reducing-effect of latanoprost, but in eyes with the functional trabecular meshwork partially opened, latanoprost has some effect. This may indicate that latanoprost can increase aqueous drainage through trabecular route.

References:

1. Ritch R, Ishikawa H, Rothman R, *et al*. The efficacy of Latanoprost is independent of the width of the ciliary body face. J Glaucoma. 2002;11:239-243. **2.** Chew PT, Aung T, Aquino MV, Rojanapongpun P; EXACT Study Group. Intraocular pressure-reducing effects and safety of latanoprost *versus* timolol in patients with chronic angle-closure glaucoma.Ophthalmology. 2004 Mar; a111(3):427-34. **3.** Alexander JP, Samples JR, Van Buskirk EM, Acott TS. Expression of matrix metalloproteinases and inhibitor by human trabecular meshwork. Invest Ophthalmol Vis Sci. 1991 Jan;32(1):172-80. **4.** Zhang SH, Zhao JL. The effect of PGF2 and 2%pilocarpine on the extracellular matrix in cultured pig trabecualr cells. Compilation of the 3rd resident day of Ophthalmlogy in PUMC AND in memorial of 90th anniversary of professor Cheng HU. Beijing (2004.11.28) p15. **5.** Gabelt BT, Kaufman .Prostaglandin F2α increases uveoscleral outflow in the Cynomoglus monkey P. Exp Eye Res 1989; 49: 389-402. **6.** Kook MS, Cho HS, Yang SJ, Kim S, Chung J. Efficacy of latanoprost in patients with chronic angle-closure glaucoma and no visible ciliary-body face: a preliminary study. J Ocul Pharmacol Ther. 2005 Feb;21(1):75-84.

P231 THE EFFECTS OF LATANOPROST, TRAVOPROST, AND BIMATOPROST ON THE DIURNAL IOP VARIATION IN EYES WITH EXFOLIATION SYNDROME ASSOCIATED WITH OCULAR HYPERTENSION

I.F. Hepsen, E. Ozkaya
Turgut Ozal Med. Center, Malatya, Turkey

Purpose: To compare the diurnal IOP reductions induced by latanoprost, travoprost, and bimatoprost in eyes with pseudoexfoliation syndrome associated with elevated IOP.

Design: Prospective, randomized and single masked study.

Participants: Forty-five patients with pseudoexfoliation syndrome associated with ocular hypertension were enrolled.

Methods: Each patient underwent a baseline diurnal (24 hour) IOP curve testing at 6, 9 AM, at noon, at 3, 6, 9 PM, and at midnight by using Goldmann applanation tonometer with slit-lamp. Patients were then randomized to receive either latanoprost 0.005%, travoprost 0.004%, or bimatoprost 0.03% once a day for three months. Diurnal curve testing was repeated at first week, first month, and the third month.

Main outcome measure: Goldmann applanation tonometry.

Results: Latanoprost 0.005%, travoprost 0.004%, and bimatoprost 0.03% significantly lowered IOP from baseline (p= 0.001 for all). Generally, all three-study medicines have similar diurnal reduction of in IOP at every timepoint measured. Although there was no statistically significant difference in the mean diurnal IOP between three groups at first week and first month, bimatoprost reduced the pressure more than latanoprost and travoprost at the end of the third month (bimatoprost: 33.4% reduction, 7.8 mm Hg; latanoprost: 30.6% reduction, 7.1 mm Hg; travoprost: 30.4% reduction, 6.6 mm Hg) (p=0.005). The between-group differences reached statistical significance at 6 and 9 AM in the third month (p= 0.035, and 0.013, respectively).

Conclusion: In eyes with pseudoexfoliation syndrome associated with ocular hypertension, bimatoprost, travoprost, and latanoprost have similar diurnal efficacy at the biginning. However, bimatoprost provides a greater diurnal pressure reduction in long term.

References:

1. Ritch R, Schlötzer-Schrehardt U: Exfoliation syndrome. Surv Ophthalmol 2001;45:265–315. **2.** Zeimer RC. Circadian variation in intraocular pressure. In: Ritch R, Shields MB, Krupin T, eds. The Glaucomas. St Louis, Mosby; 1996:429-45. **3.** Konstas AG, Mantziris DA, Stewart WC. Diurnal intraocular pressure in untreated exfoliation and primary open-angle glaucoma. Arch Ophthalmol 1997;115:182-5. **4.** Konstas AG, Mantziris DA, Cate EA, Stewart WC. Effect of timolol on the diurnal intraocular pressure in exfoliation and primary open-angle glaucoma. Arch Ophthalmol 1997;115:975-9. **5.** Orzalesi N, Rossetti L, Bottoli A, Fumagalli E, Fogagnolo P. The effect of latanoprost, brimonidine, and a fixed combination of timolol and dorzolamide on circadian intraocular pressure in patients with glaucoma or ocular hypertension. Arch Ophthalmol 2003;121:453-7. **6.** The Advanced Glaucoma Intervention Study (AGIS): The relationship between control of intraocular pressure and visual field deterioration. The AGIS Investigators. Am J Ophthalmol 2000;130:429–40. **7.** Brubaker RF. Mechanism of Action of Bimatoprost (Lumigan™). Surv Ophthalmol 2001;45(Suppl 4):347–51.

P232 IBUPROFEN ORAL ADMINISTRATION INCREASES THE INTRAOCULAR PRESSURE-LOWERING EFFECT OF LATANOPROST IN PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

F Parmeggiani, C Campa, C Incorvaia, P Perri, A Sebastiani, C Costagliola
University of Ferrara, Italy, Ferrara, Italy

Objective: Latanoprost has been shown to be effective in reducing intraocular pressure (IOP) both in patients affected by primary open-angle glaucoma (POAG), and in healthy normotensive volunteers. Therapeutic and side-effect profiles of latanoprost can be adequately explained through its predominantly stimulation of FP-type prostanoid receptors. Recently, the latanoprost ocular hypotensive effect has been examined during the co-administration of different non-steroidal anti-inflammatory drugs (NSAIDs), without obtaining any unequivocal result. The aim of this clinical study has been to verify the short-term influence of an orally administered NSAID on the IOP of POAG patients in therapy with topical prostaglandins analogue through a randomized cross-over double-blind study.

Design: Randomized cross-over double-blind study.

Participants and/or controls: Sixteen POAG adults, receiving 0.005% latanoprost eyedrops once daily, were treated with either 400 mg ibuprofen single-dose or placebo. The alternative regimen was given seven days later, an adequate time lag for the ibuprofen single-dose washout.

Methods: In both study phases, IOP was recorded at baseline and at the following intervals: 1, 2, 4, 8, 12, and 24 hours.

Main outcome measure: In all patients IOP was evaluated by a calibrated applanation tonometer.

Results: After ibuprofen administration, there was a noticeable IOP decrease (with a fall at the 1st hour, $p < 0.01$), which remained still significant 4 hours later ($p < 0.05$) (Figure 1). At the 12th and 24th hour checks unremarkable IOP differences were recorded between the two regimens.

Conclusions: In POAG patients ibuprofen single-dose significantly enhances the latanoprost-induced IOP-lowering effect during the short plasma half-life of this NSAID.

References:

1. Alm A. Prostaglandin derivates as ocular hypotensive agents. Prog Retin Eye Res 1998; 17: 291-312. **2.** Davies NM. Clinical pharmacokinetics of ibuprofen. The first 30 years. Clin Pharmacokinet 1998; 34: 101-154. **3.** Kashiwagi K, Tsukahara S. Effect of non-steroidal anti-inflammatory ophthalmic solution on intraocular pressure reduction by latanoprost. Br J Ophthalmol 2003; 87: 297-301. **4.** Resul B, Stjernschantz J, Selen G, Bito L. Structure-activity relationships and receptor profiles of some ocular hypotensive prostanoids. Surv Ophthalmol 1997; 41 (Suppl 2): S47-52. **5.** Sponsel WE, Paris G, Trigo Y, *et al*. Latanoprost and brimonidine: therapeutic and physiologic assessment before and after oral nonsteroidal anti inflammatory therapy. Am J Ophthalmol 2002; 133: 11-18.

P233 EXPERIENCE OF USING BRINZOLAMIDE – SWITCH FROM DORZOLAMIDE

H. Hata, K. Tanka, K. Shimizu, H. Watanabe, T.S. Tochikubo
Toho University School of Medicine, Ota-ku, Japan

Purpose: The carbonic anhydrase inhibitors acetazolamide (oral) and dorzolamide ophthalmic suspension and brinzolamide ophthalmic suspension (which became available in 2002) are used

for the treatment of glaucoma. From the viewpoint of drug compliance, we examined the changes in intraocular pressure (IOP) for patients switched from dorzolamide 1% to brinzolamide 1% therapy (which requires a lower instillation frequency).
Design: Comparative interventional study.
Participants: The subjects were 47 eyes of 30 patients in whom dorzolamide 1% had been used for the treatment of glaucoma. The male-female ratio was 30 eyes: 17 eyes. Among the 47 eyes, there were 18 eyes with open-angle glaucoma, 13 eyes with closed-angle glaucoma, four eyes with normal tension glaucoma and 12 eyes with secondary glaucoma. We included the patients who were on adjunctive therapy, but excluded patients in whom the concomitant drug was switched to another medication.
Intervention: Dorzolamide 1% was switched to brinzolamide 1%, and the IOP reductions and percent changes in IOP before the switch (baseline IOP) and at two weeks to six months after the switch were calculated.
Main outcome measures: The IOP reductions were evaluated by Wilcoxon signed-rank test (modified). IOP was measured three times with a noncontact tonometer and the mean value was used. The percent changes in IOP were calculated by dividing the differences in IOP before and after administration by IOP before administration.
Result: Baseline IOP was 18.9 ± 6.3 mmHg, and 18.3 ± 6.3 mmHg (p=0.0083) at two weeks after the switch to brinzolamide, 17.6 ± 6.7 mmHg (p=0.0083) after a month, 16.6 ± 6.1 mmHg (p=0.00038) after two months, 16.9 ± 6.1 mmHg (p=0.0013) after three months, 16.7 ± 4.3 mmHg (p=0.0037) after four months, 16.6 ± 4.1 mmHg (p=0.0014) after five months and 16.5 ± 4.0 mmHg (p=0.0005) after six months, which showed significant IOP reductions compared with the baseline IOP at all the time points. The percent changes in IOP were 4.60% at two weeks after the switch, 7.67% after one month, 11.81% after two months, 10.80% after three months, 10.00% after four months, 9.88% after five months and 10.25% after six months.
Conclusion: With regard to brinzolamide, not only the need of lower instillation frequency compared with dorzolamide but also further IOP-lowering efficacy was recognized. We consider brinzolamide therapy to be very useful in the cases where no IOP reduction is observed with the adjunctive use of dorzolamide.
References:
1. Sall K, *et al.* Surv Ophthalmol 44 : 155-62, 2000 **2.** Maren T, *et al.* Drug Dev Res 10 : 255-276, 1987 **3.** DeSantis L *et al.* Surv. Opthalmol 44 : 119-129, 2000 **4.** Silver H *et al.* Am J Ophthalmol 126 : 400-408, 1998 **5.** Stams T *et al.* Protein Sci 7 : 556-63, 1998

P234 THE EFFICACY OF SUBSTITUTING BRINZOLAMIDE FOR TIMOLOL IN THE COMBINATION THERAPY WITH LATANOPROST AND TIMOLOL
H. Tsukamoto, H. Ikeda, T. Sone, S. Mukai, T. Hirayama, S. Sugimoto, K. Kihira, H. Mishima
Hiroshima University Hospital, Hiroshima, Japan

Objective: To evaluate the efficacy of substituting brinzolamide for timolol in patients with glaucoma treated by latanoprost and timolol.
Design: Prospective interventional case series.
Participants: Twenty Japanese patients with open-angle glaucoma who had been under treatment with latanoprost 0.005% and timolol 0.5% for one month or more.
Intervention: Latanoprost instillation (once daily) was continued and timolol 0.5% twice daily was substituted with brinzolamide 1% twice daily.
Main outcome measures: Intraocular pressure (IOP) 4, 8 and 12 weeks after the substituting.
Results: Of the 20 patients, one patient dropped out because of ocular discomfort. Consequently, 19 patients were accepted for the analysis of IOP. IOP (mean ± standard deviation) before the substituting brinzolamide for timolol was 16.9 ± 1.8 mmHg. IOPs 4, 8 and 12 weeks after the substituting brinzolamide for timolol were 16.4 ± 2.3 mmHg, 16.4 ± 2.1 mmHg and 16.3 ± 2.1 mmHg, respectively. There were no significant differences between the IOPs before and after the substituting (p=0.29 at 4 weeks, p=0.16 at 8 weeks and p=0.07 at 12 weeks, Wilcoxon signed rank test). Substituting brinzolamide for timolol maintained stable IOP during 12 weeks.
Conclusions: Substituting brinzolamide 1% for timolol 0.5% maintained stable IOP in patients with glaucoma treated by latanoprost and timolol.
References:
1. Puscus I *et al*: Int J Cli Pharmacol Ther, 1995

P235 A SINGLE ARM OPEN LABEL STUDY OF THE EFFICACY AND SAFETY OF TRAVATAN AND AZOPT COMBINED THERAPY IN PATIENTS WITH OPEN-ANGLE GLAUCOMA OR OCULAR HYPERTENSION FOR WHOM ADDITIONAL IOP LOWERING IS REQUIRED
W. Franks[1], N. Anand[2], M. Clowes[2], M. Eckstein[3], L. George[3], P. Andreou[4], S. Ghazi-Nouri[4], P. Phelan[5], S. Fraser[5], I. Cunliffe[6], A. Indar[1], A. Nylander[7]
[1]Moorfields Eye Hospital, London, United Kingdom, [2]Huddesfield Royal Infirmary, Huddersfield, United Kingdom, [3]Sussex Eye Hospital, Brighton, United Kingdom, [4]Broomfield Hospital, Chelmsford, United Kingdom, [5]Sunderland Eye Infirmary, Sunderland, United Kingdom, [6]Birmingham Heartlands Hospital, Birmingham, United Kingdom,[7]Blackburn Royal Infirmary, Blackburn, United Kingdom

Objectives: The primary objective of this study was to demonstrate that combined Travatan and Azopt therapy is superior in lowering intraocular pressure (IOP) compared to Travatan alone in patients with open angle glaucoma or ocular hypertension. The secondary objective was to demonstrate the percentage of patients achieving IOP levels of less than 18mmHg in accordance with the AGIS guidelines[1].
Design: The design of this study was single arm, open label where the patients acted as their own controls. Patients entered the study having completed at least 6 weeks Travatan monotherapy. Azopt was then added to their treatment regimen for the 12 week duration of the study. IOP was measured at baseline and after 4 and 12 weeks of Travatan and Azopt treatment.
Participants: A total of 82 patients were enrolled in the study, all of which were analysed in the safety population. 79 of these patients were analysed in the intent-to-treat population.
Intervention: The study medications were IOP lowering drugs: Travatan (travoprost 40ug/ml eye drops solution) once daily and Azopt (brinzolamide 10mg/ml eye drops suspension) twice daily.
Main outcome measures: The primary endpoints of the study were mean IOP reduction from baseline, collection of adverse events and results of safety assessments.
Results: Compared to the baseline data with Travatan treatment only, IOP was decreased after 4 and 12 weeks of combined Travatan and Azopt therapy by an average of 17.4% and 18.4% respectively. At baseline only 6.3% of patients had an IOP lower than 18mmHg whereas at 4 and 12 weeks, 53.8% and 60.6% of patients respectively had an IOP lower than 18mmHg. 22 patients had a total of 25 treatment related adverse events. Of these there were 8 incidences of ocular hyperaemia, 6 of dysgeusia and 4 of eye irritation. There were no clinically significant changes in the results of the safety assessments during the trial period.
Conclusion: We conclude that combined Travatan and Azopt therapy significantly lowers IOP compared to that seen with Travatan alone. Combined therapy resulted in a significantly greater percentage of patients achieving IOPs of less than 18mmHg.
References:
1. The AGIS Investigators. The advanced glaucoma intervention study (AGIS): 7. The relationship between control of intraocular pressure and visual field deterioration. Am J Ophthalmol 2000; 130:429-440

P236 STUDY OF ANTIRADICAL ACTIVITY OF THE DRUGS FOR GLAUCOMA TREATMENT
N.I. Kurysheva[1], A.P. Piryazev[2], A.A. Azizova[2], V.N. Trubilin[3], A.V. Aseichev[2]
[1]Institute, Moscow, Russian Federation, [2]The Institution of Physical and Private Hospital Mebioextrem, Moscow, Russian Federation, [3]The Institution of Medical and, Moscow, Russian Federation

Objective: The oxygen-free radicals are involved in the pathogenesis of glaucoma neuropathy via the reperfusion mechanisms (J.Flammer, 2004) and contribute to reduction of outflow facility because of morphologic alterations in trabecular cells (J.Polansky, 1984; A.Bunin, 1985) especially while the antioxidant activity of aqueous humor in glaucoma is reduced (N.Kurysheva, 1996). That is why the potential antioxidant properties of the most widely used ocular hypotensive agents are very important. The purpose is to assess the antiradical activity of the new drugs for glaucoma treatment *in vitro*.
Design: Experimental study.
Participants and/or controls: No patients. Six drugs for the topical glaucoma treatment have been studied *in vitro*.
Methods: The antiradical activity of the different dosages (10 mcl, 50 mcl or 100 mcl) of Travaprost 0,004%, Latanoprast 0,005%, Brinzolamide ophthalmic sol.1%, Dorzolamide hydrochloride 2%, Betaxolol hydrochloride 0,5% and Timolol maleat 0,5% in the forms of medicinal drugs for clinical application have been studied using the chemiluminescence method in the ABPA (2,22-azo-bis(2-amidinopropane) hydrochloride) –luminol-system.
Main outcome measures: The antiradical activity of a medicine presented in percent.
Results: The antiradical activity of the drugs has been reduced in the row Travaprost (81%), Brinzolamide (55%), Latanoprast (50%), Dorzolamide (34%), Timolol (17%). The oxidation of luminal has been even reduced while more dosage of Travatan was added into the ABPA-luminol-system (Fig.1). In contrast to other drugs Betaxolol failed to produce the antiradical effect. The same result we observed in the previous study (N.Kurysheva, 1998).
Conclusions: The antiradical properties of the drugs for glaucoma treatment, especially of the new prostaglandin analogues, may indeed be one of the important factors contributing to their therapeutic activity.
References:
1. Bunin A., Babizhaev M. and Suprun A. (1985). Participation of lipid peroxidation in destruction of ocular drainage system in open-angle glaucoma. Vestn. Oftalmol.2, 13-16. **2.** Flammer J. (2004). Pathogenesis of glaucoma optic neuropathy (GON). Adv. Clin. Exp. Med. 13, 389-394. **3.** Kurysheva, N.I., Vinetckaya, M.I., Demchuk, M.L. and Erychev, V.P. (1996). Contribution of free radical reactions of chamber humor to the development of primary open-angle glaucoma Vestn. Oftalmol. 4, 3-5. **4.** Kurysheva, N.I., Deeva I, Deyev A. (1998). Comparative studies of antiradical activity of antiglaucoma drugs. Vestn. Oftalmol. 2, 6 – 9 . **5.** Polansky, J., Wood, J., Maglio, M., Addison, J. and Alvarado J. (1984). Peroxide dammed to human trabecular cells: a possible model for morphologic alterations in aging and glaucoma. Invest. Ophthalmol. Vis. Sci. Suppl. 25, 122.

P237 THE NEUROPROTECTIVE EFFECT OF BRIMONIDINE IN EXPERIMENTAL GLAUCOMA RAT MODEL
C.K. Park, J.I. Moon, H.S. Kim, J.H. Kim
College of Medicine, The Catholic University, Seoul, South-Korea

Introduction: Neuronal cells undergo apoptosis when neurotrophic factor supply is deficient as a result of an injury, trauma, or neurodegenerative disease. There are many studies that neurotrophic factor deficiency is compensated at pertinent stage after neuronal damage, it may be applied as one of the therapies against glaucoma. Brimonidine, a drug that decreases intraocular pressure in part by reducing aqueous humor production, is an alpha 2-adrenergic receptor agonist.
Aim of the study: In recent a number of studies, brimonidine has been evaluated as a neuroprotective drug for glaucoma. This study examined the neuroprotective mechanism of Brimonidine using experimentnal glaucoma model applied by cauterization of episcleral vein.
Methods: We established experimental glaucoma rat model induced by episcleral veinous occlusion resulted in chronic ocular hypertension. For evaluation of neuroprotective effect of brimonidine, we observed mRNA expression level of BDNF and anti-apoptotic molecules, bcl-2 and bcl-xl, using RT-PCR method. Also, by evaluating cellular localization of BDNF through immunohistochmistry, we examined that brimodinidine has mainly effect to certain cell type under chronic injury.
Results: In experimental group with brimonidine, the expression of bcl-2 and bcl-xl mRNA was increased and that of BDNF was also induced. In immunohistochemical study, BDNF that had regulated by brimonidine in mRNA level was shown cellular localization on Muller cells and retinal ganglion cell layer.
Conclusion: Conclusively, brimonidine in ocular hypertension model play a neuroprotective role effectively by up-regulating BDNF expression, and through anti-apoptotic regulation that depends on the maintenance of mitochodrial membrane impermeability in association with increased levels of BCL-2 and BCL-XL.
References:
1. Akira Sawada and Arthur H. Neufeld. (1999). Confirmation of the rat model of chronic, moderately elevated intraocular pressure. Exp.Eye Res. 69, 525-531 **2.** Caprioli J. Neuroprotection of the optic nerve in glaucoma. (1997). Acta Ophthalmol Scand. 75, 361-367 **3.** Gao H, Qiao X, Cantor LB, WuDunn D. Up-regulation of brain-derived neurotrophic factor expression by brimonidine in rat retinal ganglion cells. Arch Ophthalmol. 2002 Jun;120(6):797-803. **4.** Garcia-Valenzuela E, Shareef S, Walsh J, Sharma SC. (1995). Programmed cell death of retinal ganglion cells during experimental glaucoma. Exp. Eye Res. 61, 33-44 **5.** Vidal-Sanz M, Lafuente MP, Mavor-Torroglosa S, Aguilera ME, Miralles de Imperial J, Villegas-Perez MP. Brimonidine's neuroprotective effects against transient ischaemia-induced retinal ganglion cell death. Eur J Ophthalmol. 2001 Jul-Sep;11 Suppl 2:S36-40. **6.** Wheeler L, Woldemussie E, Lai R. Role of alpha-2 agonists in neuroprotection. Surv Ophthalmol. 2003;48 Suppl(1):S47-51.

P238 INDUCTION OF HEAT SHOCK PROTEIN IN THE OPTIC NERVE TISSUE USING TRANSPUPILLARY THERMOTHERAPY
K.H. Park[1], J.M. Kim[2], Y.J. Kim[3], H.J. Park[4], D.M. Kim[1]
[1]Seoul National Univ. College of Medicine, Seoul, South-Korea, [2]Kangbuk Samsung Hospital, Seoul, South-Korea, [3]Seoul Artificial Eye Center, Seoul, South-Korea, [4]Merit Eye Clinic, Seoul, South-Korea

Purpose: In chronic intraocular pressure (IOP) elevation model of rats, it has been found that over-expressed Hsp70 increases the survival rate of retinal ganglion cells (RGCs). The purpose of this study was to develop a method to induce Hsp70 in the optic nerve tissue using transpupillary thermotherapy(TTT) and to search the optimum laser setting of Hsp70 induction without tissue damage.
Design: Experimental study.
Participants: Fifty Norway brown rats were used in the experiment.
Methods: The various exposure power (20 - 200 mW) were used with the same exposure duration, 60 seconds. The laser beam was focused to the center of the optic nerve head. Left eyes were used as controls. Hsp70 expression patterns were evaluated with immunohistochemical staining and western blot, and the optic disc structures were examined by confocal scanning laser ophthalmoscope and scanning electron microscopy (SEM).
Results: In the histologic findings, Hsp70 induction after TTT of 100 mW for 60 seconds occurred at the optic nerve head. Over the 140 mW, Hsp70 induction occurred with photocoagulation

finding of vessel and nerve. In changing power group, Hsp 70 was induced greater after TTT of 100mW, 120mW and 140mW than control eyes. In changing exposure duration group, Hsp70 was induced normally but increased progressively after increasing exposure duration. Confocal scanning laser ophthalmoscopy and SEM revealed morphologic change of optic disc at the power of 140 mW or above. Increasing the exposure duration above 1minute (2, 3, and 5 minutes) induced photocoagulation of the optic nerve tissue.

Conclusion: Transpupillary laser irradiation of 100 mW power with 60 seconds induces an induction of Hsp70 in the optic nerve tissue without tissue damage. The induction of Hsp70 by TTT can be a possible candidate of future neuroprotective therapy in glaucoma.

References:

1. Park KH, Cozier F, Ong OC, Caprioli J. Induction of heat shock protein 72 protects retinal ganglion cells in a rat glaucoma model. Invest Ophthalmol Vis Sci 2001;42:1522–1530. **2.** Reichel E, Berrocal AM, Ip M, Kroll AJ, Desai V, Duker JS, Puliafito CA. Transpupillary thermotherapy of occult subfoveal choroidal neovascularization in patients with age related macular degeneration. Ophthalmology 1999;106:1908–1914. **3.** Desmettre T, Maurage CA, Mordon S. Transpupillary Thermotherapy (TTT) With Short Duration Laser Exposures Induce Heat Shock Protein (HSP) Hyperexpression on Choroidoretinal Layers. Laser in Surgery and Medicine 2003;33:102-107. **4.** Robertson DM, Salomao DR. The effect of transpupillary thermotherapy on the human macula. Arch Ophthalmol 2002; 120:652–656. **5.** Desmettre T, Maurage CA, Mordon S. Heat shock protein hyperexpression on chorioretinal layers after transpupillary thermotherapy. Invest Ophthalmol Vis Sci 2001;42:2976–2980.

P239 NEUROPROTECTIVE EFFECTS OF BAX-INHIBITING PEPTIDES ON HYPOXIC DAMAGES IN PURIFIED CULTURED RETINAL GANGLION CELLS

Y.-N. Chen[1], M. Aihara[1], M. Araie[1], S. Matsuyama[2]
[1]University of Tokyo, Tokyo, Japan, [2]Case Western Reserve University, Cleveland, OH, United States of America

Introduction: Hypoxia induces deleterious effects on neural cells. Bax-inhibiting peptide (BIP) is a membrane permeable peptide comprised of five amino acids (VPMLK) designed from the Bax-binding domain of Ku70. It inhibits Bax-mediated translocation of cytochrome c and suppresses mitochondria-dependent apoptosis[1].

Aim of the study: We evaluate the effects of BIP on hypoxia-induced cell deaths in purified cultured retinal ganglion cells (RGCs).

Method: Purified RGCs were obtained from retina of 6-to 7-day-old rats utilizing the two-step immuno-panning procedure and cultured in serum-free medium[2]. After being pre-incubated with VPMLK (10, 50 and 200 μM) for 2 hrs, the RGCs were then incubated under hypoxic condition (5% O_2, 5%CO_2, 37°C) for 12 hours. Using the calcein-AM assay, the numbers of the viable cells were counted and the cell viabilities were calculated. A scrambled negative control of VPMLK, KLPVM (10, 50 and 200 μM), was also tested.

Results: The viability of RGC cultures after 12 hours of hypoxia was 49.0% without BIP treatment. The viability increased in a dose dependent manner with exposure to VPMLK (10 μM: 53.1%; NS, 50 μM: 57.1%; p<0.01, 200 μM: 61.3%; p<0.01, n=8), There was no significant increase of viability in the KLPVM-adding groups.

Conclusion: BIP has the protective effect against hypoxia-induced cell death of the purified RGCs. This finding suggests that Bax-mediated apoptosis plays a role in hypoxia-induced damage.

References:

1. Yoshida,T.*et al.* Biochem Biophys Res Commun. 2004 Sep 3;321(4):961-966. **2.** Otori Y, Wei JY, Barnstable CJ. Invest Ophthalmol Vis Sci. 1998;39:972–981.

P240 A SINGLE DOSE OF ORAL MEMANTINE REDUCES FUNCTIONAL AND ANATOMICAL DEFICITS IN THE RETINA PRODUCED BY AN ACUTE ELEVATION OF IOP IN PIGMENTED RABBITS

J.A. Burke, K.-M. Zhang, J. Yang, T. Lin, B. Jackson, A. Oyejide, B. Hare, L. Wheeler
Allergan, Inc., Irvine, CA, United States of America

Introduction: Memantine is a use-dependent NMDA channel blocker that has been shown to reduce neuronal injury in a wide range of in-vitro and in-vivo models[1-4].

Aim of the study: The purpose of this study is to determine if a single oral dose of memantine protects against functional and anatomical changes in the retina produced by an acute elevation of IOP in pigmented rabbits.

Methods: This is a randomized, placebo-controlled study. Twelve Dutch-belted rabbits weighing 2.5 - 3 kg each were divided into 2 groups of 6. One group received memantine (50 mg) and the other group received sugar (50 mg). Both treatments were delivered orally in a gelatin capsule, and self-ingested. Two hours after dosing, rabbits were anesthetized with 2% isofluorane, and the IOP in the OD eye was raised by 120 mm Hg for 45 minutes. To accomplish this, a reservoir with PBS was suspended 163 cm above the eye and connected to a 30 gauge needle inserted through the cornea into the anterior chamber[5]. A drop of topical anesthetic (proparacaine) was placed upon the cornea prior to needle insertion; a drop of anti-biotic/anti-inflammatory (Pred-G) was instilled following removal of the needle. Follow-up consisted of simultaneous bilateral single flash (0.001, 0.01, 1 cd.s/m2) and 30 Hz flicker (1 cd.s/m2) ERGs with the Espion® ColorDome® ganzfeld at Day 2, Week 1 and Month 1 following the IOP insult. Also at Month 1, bilateral color fundus photos, HRT optic nerve head scans and OCT radial fundus scans, were taken. At month 6, retinas from two animals each treatment group were prepared for histological analysis. Data are expressed as % of control (IOP eye / contralateral normal eye).

Results: There was better preservation of ERG responses in animals receiving memantine, especially at Month 1: ERG B-wave amplitude (% control responses) @ 0.001 cd.s/m2 for placebo and memantine were, respectively, 27 ± 10 *vs* 42 ± 14 @ Day 2; 29 ± 15 *vs* 34 ± 15 @ Week 1; and 41 ± 9 *vs* 81 ± 15 (p=0.04) @ Month 1; similar responses were obtained with the 0.01 cd.s/m2 and 1 cd.s/m2 flash intensities. Decreases in optic nerve head cup volume (HRT) and retinal thickness (OCT) were similar between groups: % of control responses for placebo and memantine for cup volume were 90 ± 8 and 92 ± 8, respectively, and for retinal thickness, the values were 85 ± 7 and 92 ± 4. The histological evaluation @ Month_6 showed less retinal cell degeneration in the memantine group compared with the placebo group.

Conclusions: Oral memantine enhanced recovery of retinal function and preserved retinal anatomy following an acute elevation of IOP.

References:

1. Chen HS. J Physiol. 1997; 499: 27-46 **2.** Lagreze WA. Invest Ophthalmol Vis Sci. 1998; 39:1063-1066 **3.** Hare W. Surv Ophthalmol. 2001; 45(suppl):284-289 **4.** Woldemussie E. J Glaucoma. 2002; 11:474-480 **5.** Buchi ER. Exp Eye Res. 1992; 4:605-613

P241 MEMANTINE PROTECTS NEURONS FROM SHRINKAGE IN THE GENICULATE NUCLEUS OF THE GLAUCOMA BRAIN

H. Yucel[1], N. Gupta[1], Q. Zhang[1], A.P. Mizisin[2], W.M. Kalichman[2], R.N. Weinreb[2]
[1]University of Toronto, Toronto, Canada
[2]U C San Diego, La Jolla, CA, United States of America

Purpose: To determine whether memantine, a NMDA open channel blocker, prevents neuron shrinkage in glaucoma in the lateral geniculate nucleus (LGN), the major target for retinal ganglion cells.

Design: Experimental study.

Participants: Sixteen adult monkeys (Macaca fascicularis) with experimental glaucoma treated with memantine (n=9) and vehicle only (n=7).

Methods: Brains with right eye unilateral experimental glaucoma were serially sectioned and left LGN relay neurons (layers 1, 4, 6) were studied following parvalbumin immunolabelling. Cell body cross-sectional areas and neurons numbers were assessed using unbiased stereological methodology. Memantine and vehicle-treated glaucoma groups were compared using t-tests, and analysis of covariance (ANCOVA). Using the generalized linear models procedure of Statistical Analysis Software (SAS, Cary, NC), neuron shrinkage was compared between the two treatment groups with % optic nerve fiber loss as a covariate.

Main outcome measures: Relay neuron size and number in the LGN.

Results: Compared to vehicle-treated animals, memantine-treated animals showed significantly less mean neuron shrinkage in layers 1 and 4 (-4.0 ± 13.9 % *vs.* 28.2 ± 17.4 %; P= 0.001), (24.9 ± 10.0 % *vs.* 37.2 ± 12.3 %; P = 0.044), respectively. For layer 6, this difference was not statistically significant (34.2 ± 10.1 % *vs.* 45.3 ± 14.5 %; P = 0.0946). ANCOVA results showed significantly less neuron shrinkage in the memantine-treated group than in the vehicle-treated group (layer 1, P=0.0002), (layer 4, P=0.0176) and (layer 6, P=0.0349). In each of these layers, neuron numbers did not differ significantly between groups.

Conclusions: Memantine protects neurons from shrinkage in the lateral geniculate nucleus following glaucomatous optic nerve injury. These findings implicate NMDA excitotoxicity in the pathobiology of degenerative changes in the brain in glaucoma.

This work was supported in part by Glaucoma Foundation, NY; E.A. Baker Foundation to Prevent Blindness, Canadian National Institute of the Blind; University of Toronto /Allergan Inc. Research Contract; Glaucoma Research Society of Canada; Foundation for Eye Research.

References:

1. Y.H. Yücel, Q. Zhang, N. Gupta, P.L. Kaufman, and R.N. Weinreb. Loss of neurons in magno and parvocellular layers of the lateral geniculate nucleus in glaucoma. Archives of Ophthalmology, 118: 378-384, 2000. **2.** Y.H. Yücel, Q. Zhang, R.N. Weinreb, P.L. Kaufman and N. Gupta. Atrophy of relay neurons in magno-and parvocellular layers of the lateral geniculate nucleus in glaucoma. Investigative Ophthalmology and Visual Science, 42: 3216-3222, 2001. **3.** A.J. Weber, H. Chen, W. C. Hubbard, P. L. Kaufman. Experimental glaucoma and cell size, density, and number in the primate lateral geniculate nucleus. Investigative Ophthalmology and Visual Science, 41; 1370-1379, 2000. **4.**Y.H. Yücel, Q. Zhang, R.N. Weinreb, P.L. Kaufman, N. Gupta. Effects of retinal ganglion cell loss on magno-, parvo-, koniocellular pathways in the lateral geniculate nucleus and visual cortex in glaucoma. Progress in Retinal and Eye Research, 22: 465-481, 2003. **5.** N Gupta and YH Yücel. Brain changes in glaucoma. European Journal of Ophthalmology, 13: 32-35, 2003. **6.** A. Luthra, N. Gupta, P.L. Kaufman, R.N. Weinreb, Y.H. Yücel. Oxidative Injury in neural and vascular tissue of the lateral geniculate nucleus in experimental glaucoma. Experimental Eye Research, 80:43-49; 2005. **7.** Y.H. Yücel, N. Gupta, Q. Zhang, A.P. Mizisin, M. W. Kalichman, R. N.Weinreb. Memantine Attenuates Neuron Atrophy in the Lateral Geniculate Nucleus in Experimental Glaucoma. Archives of Ophthalmology (Accepted, 2005). **8.** W. A. Hare, E. Woldemussie, R. N. Weinreb, H. Ton, G. Ruiz, M. Wijono, B. Feldmann, L. Zangwill, Wheeler, L. Efficacy and safety of memantine treatment for reduction of changes associated with experimental glaucoma in monkey, II: Structural measures. Investigative Ophthalmology and Visual Science, 45: 2640-2651; 2004. **9.** S.A. Lipton. Possible role for memantine in protecting retinal ganglion cells from glaucomatous damage. Survey of Ophthalmology 48: S38-S46; 2003.

P242 NEURO-PROTECTIVE EFFECT OF EBHB ON GLAUCOMA PATIENTS

D. Liu[1], X. Chen[2], R. Pan[2]
[1]West China Hospital, Chengdu, China, [2]West China Eye Center, Chengdu, China

Purpose: To assess the neuro-protective effect of EBHB (a Chinese herbal medicine) in glaucoma patients.

Design: Prospective observational case control series.

Methods: 36 chronic glaucoma patients with controlled IOP, were randomly divided into two groups. Erigeron Breviscapus Hand-Mazz (EBHB), a Chinese herbal medicine, or placebo was taken three times per day for six months in a double blind way.

Main outcome measures: The retinal blood flow and visual field were followed up every two months.

Results: Compared with the baseline, the mean sensitivity (MS) increased from 13.35 ± 7.32dB to 17.74 ± 7.40dB in EBHB group(P<0.01). There was a significant increase in retinal blood flow after taking EBHB.

Conclusion: EBHB can increase retinal blood flow and improve visual field in glaucoma patients.

References:

1. Ravalico G, Pastori G, Toffole G, *et al*: Visual and blood flow responses in low-tension glaucoma. Surv Ophthalmol 1994; 38(suppl): s173-176 **2.** Cellini M, Possati GL, Caramazza N, *et al*: Colour Doppler analysis of the choroidal circulation in chronic open-angle glaucoma. Ophthalmologica 1996; 210:200-202 **3.** Yin ZQ, Vaegan, Millar TJ, *et al*: Widespread choroidal insufficiency in primary open-angle glaucoma. J Glaucoma 1997; 6:23-32 **4.** Hollo G, Greve EL, Van den Berg TJ, *et al*: Evaluation of the peripapillary circulation in healthy and glaucoma eyes with scanning laser Dopplor flowmetry. Int Opthalmol 1996-97; 20:71-77 **5.** Nicolela MT, Hnik P, Drance SM: Scanning laser Doppler flowmeter study of retinal and optic disc blood flow in glaucomatous patients. Am J Ophthalmol 1996;122:775-783

P243 NEUROREGENERATIVE AND NEUROPROTECTIVE EFFECTS OF RHO-ASSOCIATED PROTEIN KINASE INHIBITORS IN RAT EYES

H.T. Tanihara[1], H. Tokushige[2], Y.T. Takayama[2], S.T. Nemoto[2], S.T. Tajika[2], M.T. Uehata[3], Y.I. Inomata[1], T.K. Kawaji[1]
[1]Kumamoto University, Kumamoto, Japan, [2]Senju Pharmaceutical Co., Ltd., Kobe, Japan, [3]Mitsubishi Pharma Co. Ltd., Yokohama, Japan

Objective: To investigate the neuroregenerative and neuroprotective effects of rho-associated protein kinase (ROCK) inhibitors, Y-39983 and Y-27632.

Methods: Retinal ganglion cells (RGCs) from retinas of 6- to 8-day-old rats were purified by a two-step immunopanning procedure. In experiments using cultured RGCs, Y-39983 for inhibition of and/or LPA for activation of rho-ROCK signinaling were added into the culture media, and axon lengths of RGCs were measured. Also, two types of animal models, axotomy and retinal ischemia, were created for evaluation of neuroprotective and neuroregenerative activities of ROCK inhibitors. Optic nerve transection and subsequent grafting of a peripheral nerve to the eye was conducted. Retinal damage was induced by transient retinal ischemia with intraocular pressure (IOP) elevation for 45 minutes in rats. Selective ROCK inhibitor, Y-39983 (or Y-27632), was injected into the vitreous prior to or simultaneously creation of animal models. In addition, Y-39983 was introduced around the grafted nerve in axotomy models. A series of morphometric analyses were performed.

Results: In experiments using cultured RGCs, axon elongation was associated with the addition of Y-39983 and LPA. The addition of Y-39983 into culture media caused longer axons from RGCs in comparison with control experiments. Also, in our studies using axotomy models, Y-39983 induced larger number of regenerating axons revealed by retrograde labeling with fluorescence dye. Morphometric analysis demonstrated that Y-27632-treated eyes provided significant neuroprotective effects 3 hours prior to and simultaneously on transient retinal ischemia. The mean number of survived RGCs was significantly increased by Y-27632 treatments in retinal ischemia.

Conclusions: Our results indicated that selective ROCK inhibitors, Y-39983 and Y-27632, elicit neuroregenerating and neuroprotective effects in rat eyes.

References:
1. Honjo M, Tanihara H, Inatani M, *et al.* Effects of Rho-associated protein kinase inhibitor, Y-27632, on intraocular pressure and outflow facility. Invest Ophthalmol Vis Sci 42:137-44, 2001. **2.** Rao PV, Deng PF, Kumar J, *et al.* Modulation of aqueous humor outflow facility by the Rho kinase-specific inhibitor Y-27632. Invest Ophthalmol Vis Sci 42: 1029-1037, 2001. **3.** Waki M, Yoshida Y, Oka T, Azuma M. Reduction of intraocular pressure by topical administration of an inhibitor of the Rho-associated protein kinase. Curr Eye Res 22: 470-474, 2001. **4.** Honjo M, Inatani M, Kido N, *et al.* Effects of protein kinase inhibitor, HA1077, on intraocular pressure and outflow facility in rabbit eyes. Arch Ophthalmol 119: 1171-1178, 2001. **5.** Honjo M, Inatani M, Kido N, *et al.* A myosin light chain kinase inhibitor, ML-9, lowers the intraocular pressure in rabbit eyes. Exp Eye Res 75: 135-142, 2002.

P244 APPLICATION OF THE OKOVIDIT AS NEUROPROTECTOR IN GLAUCOMA TREATMENT

E.M. Mironova[1], S.Y. Anisimova[2], G.A. Shilkin[1], E.V. Egorova[1], Y.E. Nersesov[1], N.N. Ereskin[1]
[1]The S.N. Fyodorov Eye Institution, Moscow, Russian Federation
[2]Eye Center East Sight Recover, Moscow, Russian Federation

Purpose: Neuroprotector's effects of Okovidit (extract of Laminaria, LTD 'Dioptra' , RF) on patients with primary open anlge glaucoma (POAG).
Patients and methods: Okovidit is a transdermal 1% gel wich the principal active component is an extract from maritime alga Laminaria Soderis, 23 aminoacidi, micro- and macro-elements, liodin up to 03 %. Fifty two patients (74 eyes) with advanced POAG and normalized intraocular eye pressure were examined. Thirty two patients formed the main group and 20 patients formed the control group (placebo). The medical form OKOVIDIT was applied ameliorating the blood supply and methabolism of the whole eye for the treatment of the patients of the main group. Okovidit was applied by transdermal method (via the skin of inferious eye lid). Treatment takes ten days, two hours per day. To appreciate the results the electrophysiological methods were applied (EOG,ERG, determination of the levels of retina's electrical sensibility,electrical lability of optic nerve, computer perimetry). Standard clinical methods of examination also were used.
Results: We may see that in the main group, having Okovidit, differently from the placebo group, the visual acquity really increased by 0,13 ± 0,03, electrophysiological results of retina function ameliorated (EOG by 16,7 ± 23%, b-wave of the EOG in red by 2,8 ± 0,5 B) Optic nerve ameliorates too, the quantity of relative and absolute scotoms decreases, the foveal photosensibility increases by 1,8 ± 0,33 Db .
Conclusion: Okovidit ameliorates the functional state of the retina and of the optic nerve, probably provokes a direct retino-and neuroprotecting action and suitable to be used in complex therapy of patients with POAG.

P245 STUDIES ON ENDOCANNABINOID LEVELS IN NORMAL AND GLAUCOMATOUS HUMAN EYES

I. Matias[1], J. Chen[2], T.L. Ta Lu[2], T. Dinh[2], S. Venezia[1], A. Nieves[2], V. Di Marzo[1], D. Woodward[2]
[1]Institute of Biomolecular Chemistry CNR, Pozzuoli (Napoli), Italy, [2]Dept. of Biosciences, Allergan, Irvine, CA, United States of America

Purpose: Synthetic cannabinoids and their endogenous ligands, endocannabinoids, have been reported to lower intraocular pressure[1-2]. We investigated the levels of the endocannabinoids 2-arachidonoylglycerol (2-AG,[3]), anandamide (AEA, [4]), and palmitoylethanolamide (PEA) as an 'entourage compound' in different ocular tissues from normal or glaucomatous donors.
Participants and controls: Twelve normal and glaucomatous donors have been used for these studies.
Methods: 2-AG, PEA, and AEA in ocular tissues were extracted in chloroform/methanol[5]. Deuterated standards d5-2-AG, d8-AEA, d4-PEA were added as internal standards. The endocannabinoids were separated and subjected to liquid chromatography-mass spectrometry[6].
Main outcome measures: The levels of endocannabinoids 2-AG, AEA, and PEA were quantified by isotope dilution and normalized per g wet tissue weight.
Results: 2-AG, PEA, and AEA were detected in all the human ocular tissues examined. 2-AG levels were highest in the retina – ciliary body and choroid – iris and cornea. PEA and AEA levels in the iris were more than 3 times higher than their respective levels in the other ocular tissues. In human glaucomatous eyes compared to normal eyes, 2-AG levels were significantly decreased by 44% in the ciliary body and PEA levels by 40% in the ciliary body and by 54% in the choroid. The differences between 2-AG and AEA levels were less pronounced in the human eyes compared to other mammalian tissues, where 2-AG levels typically exceed those of AEA by about 100-fold.
Conclusions: The detection of 2-AG, PEA, and AEA in ocular tissues of normal or glaucomatous donors eyes provided further support for the involvement of endocannabinoids in ocular physiology. In glaucomatous human eyes, the significantly reduced 2-AG and PEA levels in the ciliary body and PEA levels in the choroid suggest that pathological alterations in endocannabinoid levels may have a role in this disease state.
References:
1. Jarvinen T, Pate DW, Laine K. Cannabinoids in the treatment of glaucoma. Pharmacol. Ther. 2002; 95: 203-220. **2.** Laine K, Jarvinen K, Mechoulam R, Breuer A, Jarvinen T. Comparison of the enzymatic stability and intraocular pressure effects of 2-arachidonylglycerol and noladin ether, a novel putative endocannabinoid. Invest Ophthalmol Vis Sci. 2002; 43 :3216-3222. **3.** Mechoulam R *et al.* Identification of an endogenous 2-monoglyceride, present in canine gut, that binds to cannabinoid receptors. Biochem Pharmacol. 1995; 50: 83-90. **4.** Devane WA *et al.* Isolation and structure of a brain constituent that binds to the cannabinoid receptor. Science 1992; 258: 1946-1949. **5.** Bisogno T, Maurelli S, Melck D, De Petrocellis L, Di Marzo V. Biosynthesis, uptake, and degradation of anandamide and palmitoylethanolamide in leukocytes. J Biol Chem. 1997; 272: 3315-3323. **6.** Di Marzo V *et al.* Leptin-regulated endocannabinoids are involved in maintaining food intake. Nature 2001; 410: 822-855.

P246 THE EFFECT OF A SINGLE SUBLINGUAL CANNABINOID ADMINISTRATION ON IOP IN PATIENTS WITH GLAUCOMA. A PLACEBO-CONTROLLED CROSS-OVER STUDY

I. Tomida[1], A. Azuara-Blanco[2], S. Neville[3]
[1]Augenarztpraxis Dr. I. Tomida, Böblingen, Germany, [2]Aberdeen Royal Infirmary, Aberdeen, United Kingdom, [3]Aberdeen Royal Infirmary, Aberdeen, United Kingdom

Introduction: The cannabinoids D9-tetrahydro-cannabinoid (D9-THC) and cannabidiol (CBD) could potentially be useful in the treatment of glaucoma. D9-THC has been reported to reduce the intraocular pressure (IOP), but is associated with psychotropic side effects. CBD has neuroprotective actions and does not induce any psychotropic side effects[1,2,3,4].
Aim of study: The purpose of this study was to assess the effect on IOP and the safety of sublingual administration of (1) a low dose of D9-THC and (2) CBD.
Methods: A randomised, double blind, placebo-controlled, four way crossover study was conducted at a single centre using cannabis based medicine extracts (CBME) of D9-THC and CBD. Six patients with ocular hypertension or early POAG received once per week a single sublingual dose at 8 a.m. of the following: 5mg D9-THC, 20mg CBD, 40mg CBD or placebo. The effects on IOP, vital signs, visual acuity and possible psychotropic side effects were assessed over 12 hours.
Results: Compared to placebo, two hours after sublingual administration of 5mg of D9-THC, IOP was significantly reduced (p=0.026). Neither dose of CBD reduced the IOP at any time. However, the higher dose of CBD (40mg) produced a transient IOP elevation at four hours after administration (p=0.028). Vital signs and visual acuity were not significantly changed by the CBMEs. One patient experienced a transient mild panic-like reaction from 2 to 6 hours after D9-THC administration.
Conclusions: Sublingual administration of 20mg CBD did not reduce the IOP but is well tolerated, whereas 40mg CBD can produce a transient increase in IOP. A single sublingual low dose of D9-THC induced a temporary reduction of IOP after two hours. Further pharmacological and experimental studies are necessary to decide upon the significance of CBME in glaucoma therapy.
References:
1. Hepler RS, Frank IR. Marihuana smoking and intraocular pressure (letter). Journal American Medical Association 1971; 217:13 92. **2.** Järvinen T, Pate DW, Laine K. Cannabinoids in the treatment of glaucoma. Pharmacology and Therapeutics 2002; 95: 203-220. **3.** Newell FW, Jay WM, Sternberg P. Use of cannabinoid derivates in glaucoma. Trans Ophthal Soc UK 1979; 99:268-271. **4.** Porcella A, Maxia Ch, Gessa GL *et al.* The synthetic cannabinoid WIN-55,212-2 decreases the intraocular pressure in human glaucoma resistant to conventional therapies. Eur J Neurosci 2001; 13: 409-412

P247 EFFECTS OF SYNTHETIC CANNABINOID WIN55212-2 IN CORNEAL EPITHELIAL WOUND HEALING IN VITRO

I. Tomida[1], A. Azuara-Blanco[2], R. Pertwee[3]
[1]Augenarztpraxis Dr. I. Tomida, Böblingen, Germany, [2]Aberdeen Royal Infirmary, Aberdeen, United Kingdom, [3]Department of Biomedical Science, Aberdeen, United Kingdom

Introduction: Topical application of cannabinoids has been explored for glaucoma treatment[1,2,3]. Previous reports have shown that the use of eye drops is associated with of ocular irritation[4,5]. The corneal epithelium has CB1 receptors, although their function in this tissue is unknown[6,7].
Aim of study: The purpose of this study was to evaluate the effect of synthetic CB1 agonist WIN 55,212-2 on corneal epithelial wound healing.
Methods: Transformed human corneal epithelial cells were cultured to a confluent monolayer. A scratch wound was performed, and the cells were exposed to different concentrations of WIN 55,212-2. The effect of a simultaneous and previous addition of the CB1 antagonist AM251 to the cells was also explored. For control purposes, the cultures were kept in medium alone, or were added dimethyl sulphoxide (DMSO), the solvent used for the CB1 agonist and antagonist. The wound area was video-monitored in a microscope stage incubator at constant 37°C, and the images were stored in an image analyser.
Results: The wound area of the untreated cultures healed completely after 22.0±4.583 hours, the one treated with DMSO after 29.0 ± 3.12 hours. WIN 55,212-2 prevented the wound healing, ultimately leading to cell death. Incubation of the cell cultures with AM251 10-12 hours before the addition of WIN 55,212-2 (1 nMol/ml) resulted in complete wound closure. However, when AM 251 and WIN 55,212-2 were added simultaneously to the cell monolayer, wound healing was prevented.
Conclusions: WIN 55,212-2 prevented corneal epithelial wound healing in a human cell line of corneal epithelium *in vitro*, leading to cell death. AM251 added prior to WIN 55,212-2 allowed the normal epithelial wound healing to occur, suggesting the possibility of a CB-receptor mediated effect. This finding may have relevance for the possible future therapeutic application of topical cannabinoids in glaucoma.
References:
1. Hepler RS, Frank IR. Marihuana smoking and intraocular pressure (letter). Journal American Medical Association 1971; 217:13 92. **2.** Newell FW, Jay WM, Sternberg P. Use of cannabinoid derivates in glaucoma. Trans Ophthal Soc UK 1979; 99:268-271. **3.**Thompson GR, Yang CL. Comparative toxicities of tetrahydropyrodobenzopyrans. The therapeutic potential of marihuana (Eds Cohen S, Stillman R) Plenum Press, New York 1975; p457-p473. **4.**Cosalanti BK, Powel SR, Craig CR. Intraocular pressure, ocular toxicity and neurotoxicity after administration of "9-Tetrahydrocannabinol or cannabichromene. Exp Eye Res 1984; 38:63-71. **5.** Green K. The ocular effects of cannabinoids. Current Topics in Eye Research (Eds Zadunaisky JA, Dawson H) Academic Press, New York 1979; p.175-p215. **6.** Porcella A, Casellas P, Gessa GL, *et al.* Cannabinoid receptor CB1 mRNA is highly expressed in the rat ciliary body: implications for the antiglaucoma properties of marihuana. Molecular Brain Research 1998; 58: 240-24. **7.** Straiker A, Maguire C, Makie K *et al.* Localization of cannabinoid CB1 receptors in the human anterior eye and retina. Invest Ophthalm Visual Sci 1999; 40: 2442-2448

P248 INTRAOCULAR PRESSURE-LOWERING EFFECTS OF TOPICAL ADMINISTRATION OF Y-39983, A NOVEL SELECTIVE RHO-ASSOCIATED PROTEIN KINASE INHIBITOR

M.I. Inatani[1], H. Tokushige[2], S. Nemoto[2], T. Tajika[2], M. Uehata[3], H. Tanihara[1]
[1]Kumamoto Univ. Grad. Sch. of Med. Sci., Kumamoto, Japan, [2]Senju Pharmaceutical Co. Ltd, Kobe, Japan
[3]Mitsubishi Pharma Co. Ltd, Yokohama, Japan

Aim of the study: To elucidate the intraocular pressure (IOP) lowering effects of Y-39983, a selective Rho-associated protein kinase (ROCK) inhibitor derived from Y-27632, and the associated characteristics in animal eyes.
Methods: The IOP, outflow facility, and safety were examined after the topical administration of Y-39983 in eyes of rabbits and monkeys. Additionally, pharmacokinetics was evaluated with topical administration of the radiolabeled compound. Blood flow at the optic nerve head was also measured by laser speckle method.
Results: In rabbit and monkey eyes, administration of 0.01% to 0.1% Y-39983 induced a significant decrease in IOP in a dose-dependent manner. In monkey eyes, at three hours after the topical administration of 0.05% Y-39983, IOP resulted in maximal reduction by an average of 2.5 mmHg. The outflow facility was 1.66 times increased in Y-39983-treated rabbit eyes. Pharmacokinetic analysis showed the peak concentrations at two hours in aqueous humor and at four hours in choroid/retina and iris/ciliary body. Autoradiogram demonstrated high radioactivities in eyelid, conjunctiva, cornea and iris/ciliary body. Increased blood flow at optic nerve head was observed during first five hours after the administration. Although no significant toxic changes in corneal surface, anterior chamber, lens, vitreous and retina were observed, conjunctival injection and hemorrhage were observed in Y-39983-treated eyes after four times of the topical administration.
Conclusion: We conclude that Y-39983 causes a remarkable reduction in IOP and a significant increase in outflow facility, and may be a useful therapeutic drug for the treatment of glaucoma.
References:
1. Honjo M, Tanihara H, Inatani M, Kido N, Yue BYJT, Narumiya S, Honda Y. Effects of Rho-associated protein kinase inhibitor, Y-27632, on intraocular pressure and outflow facility. Invest Ophthalmol Vis Sci 42:137-44, 2001. **2.** Rao PV, Deng PF, Kumar J, Epstein DL. Modulation of aqueous humor outflow facility by the Rho kinase-specific inhibitor Y-27632. Invest Ophthalmol Vis Sci 42: 1029-1037, 2001. **3.** Waki M, Yoshida Y, Oka T, Azuma M. Reduction of intraocular pressure by topical administration of an inhibitor of the Rho-associated protein kinase. Curr Eye Res 22: 470-474, 2001. **4.** Honjo M, Inatani M, Kido N, Sawamura T, Yue BY, Honda Y, Tanihara H. Effects of protein kinase inhibitor, HA1077, on intraocular pressure and outflow facility in rabbit eyes. Arch Ophthalmol 119: 1171-1178, 2001. **5.** Honjo M, Inatani M, Kido N, Sawamura T, Yue BYJT, Honda Y, Tanihara H. A myosin light chain kinase inhibitor, ML-9, lowers the intraocular pressure in rabbit eyes. Exp Eye Res 75: 135-142, 2002. **6.** Mettu PS, Deng PF,

Misra UK, Gawdi G, Epstein DL, Rao PV. Role of lysophospholipid growth factors in the modulation of aqueous humor outflow facility. Invest Ophthalmol Vis Sci 45: 2263-71, 2004.

P249 EFFECT OF ORAL ANGIOTENSIN II RECEPTOR BLOCKER ON INTRA OCULAR PRESSURE IN NORMAL SUBJECTS

K Yuki
Keio University School of Medicine, Tokyo, Japan

Purpose: To study the effect of oral angiotensin II receptor blocker (ARB) on intra ocular pressure (IOP) in normal subjects.
Design: randomized crossover double-blind study.
Participants: Twenty healthy volunteers (13 men and 7 women, age 23 to 28 years) without systemic and eye diseases participated in the study.
Methods: In the morning (10:00 hr), each subject was given either 12 mg oral candesartan cilexetil (Blopress', Takeda, Japan) or the placebo in a randomized crossover double-blind fashion. The baseline heart rate, systolic/diastolic arterial pressures (SBP/DBP), and IOP were recorded. The subjects then received oral candesartan cilexetil or placebo, and measurements were repeated hourly for 6 hr and after 24 hr. One month later, each subject received the alternative treatment. Only the right eye was measured and analyzed. Statistical analysis of the results was performed with StatView (SAS Institute, USA) using repeated measure ANOVA test. ANOVA test with Bonferroni correction was used for statistical analysis of each IOP values: a P value <0.0004 was considered to be statistically significant.
Main outcome measures: IOP, SBP, DBP and heart rate were recorded. The ocular perfusion pressure (OPP) was then calculated (OPP = 2/3 x BPm – IOP, where BPm = DBP + 1/3 x (SBP - DBP)).
Results: The IOP in the subjects who received the placebo was not altered significantly. On the other hand, as early as one hour after oral candesartan cilexetil, the IOP had fallen significantly and remained low for five hrs. (P <0.0001) compared with placebo. Candesartan cilexetil did not significantly affect perfusion pressures. No significant change in SBP, DBP, and heart rate was detected after a single oral dose of candesartan cilexetil or placebo.
Conclusions: The ARB (Candesartan cilexetil) has IOP reduction effect without affecting heart rate, blood pressure, and OPP in normal subjects.
References:
1. Danser AH, Derkx FH, Admiraal PJ, *et al.* Angiotensin levels in the eye. Invest Ophthalmol Vis Sci. 1994;35:1008-1018. **2.** Wagner J, Jan Danser AH, Derkx FH, *et al.* Demonstration of renin mRNA, angiotensinogen mRNA, and angiotensin converting enzyme mRNA expression in the human eye: evidence for an intraocular renin-angiotensin system. Br J Ophthalmol. 1996;80:159-163. **3.** Wheeler-Schilling TH, Kohler K, Sautter M, Guenther E. Angiotensin II receptor subtype gene expression and cellular localization in the retina and non-neuronal ocular tissues of the rat. Eur J Neurosci. 1999;11:3387-3394. **4.** Cullinane AB, Leung PS, Ortego J, Coca-Prados M, Harvey BJ. Renin-angiotensin system expression and secretory function in cultured human ciliary body non-pigmented epithelium. Br J Ophthalmol. 2002;86:676-683. **5.** Constad WH, Fiore P, Samson C, Cinotti AA. Use of an angiotensin converting enzyme inhibitor in ocular hypertension and primary open-angle glaucoma. Am J Ophthalmol. 1988;105:674-677. **6.** Costagliola C, Verolino M, De Rosa ML, *et al.* Effect of oral losartan potassium administration on intraocular pressure in normotensive and glaucomatous human subjects. Exp Eye Res. 2000;71:167-171.

P250 EFFECT OF STATIN DRUGS AND ASPIRIN ON GLAUCOMA PROGRESSION

R.L.S Stamper, I.T. Phan, R.J. Lowe, A. Khan, M. Trager, S.C. Lin
University of California San Francisco, San Francisco, CA, United States of America

Purpose: To determine whether use of statin drugs or aspirin affects the rate of open angle glaucoma (OAG) progression.
Methods: Patients with OAG with at least three visual field tests were recorded at the San Francisco Veterans' Administration Medical Center (SFVAMC) from 1996 to 2004. We performed a retrospective chart review of 214 eyes with OAG at the SFVAMC. Subjects included patients with OAG who used statin drugs or aspirin for greater than 23 months. Controls were patients with OAG who never used statins or aspirin. We analyzed the change in visual field mean deviation per year in patients who took statin drugs or aspirin and those who did not.
Results: There was no difference in the average change in mean deviation per year in the group using either statins or aspirin (0.1370 decibels per year) and the control group (-0.0090 decibels per year), ($p > 0.05$). The change in mean deviation per year in patients who used aspirin alone (-0.0773 decibels per year) was not significantly different from the controls ($p > 0.05$). However, the change in mean deviation per year in patients who used statins alone (-0.3072 decibels per year) was significantly different from the controls [95% CI 0.4978 -0.0987; $p <0.05$].
Conclusions: Statin drugs, but not aspirin, are associated with slowed glaucoma progression. Prospective studies are necessary to further investigate the effect of statins on open-angle glaucoma.
References:
1. Cioffi GA, Wang L, Fortune B, *et al.* Chronic ischemia induces regional axonal damage in experimental primate optic neuropathy. Arch Ophthalmol 2004;122(10):1517-25. **2.** Schori H, Kipnis J, Yoles E, *et al.* Vaccination for protection of retinal ganglion cells against death from glutamate cytotoxicity and ocular hypertension: implications for glaucoma. Proc Natl Acad Sci U S A 2001;98(6):3398-403. **3.** McGwin G, Jr., McNeal S, Owsley C, *et al.* Statins and other cholesterol-lowering medications and the presence of glaucoma. Arch Ophthalmol 2004;122(6): 822-6. **4.** Bell NP, Orengo-Nania S, Pietz K, Gross RL. Aspirin use in advanced uncontrolled glaucoma. J Glaucoma 2004;13(5):365-70. **5.** Albert MA, Danielson E, Rifai N, Ridker PM. Effect of statin therapy on C-reactive protein levels: the pravastatin inflammation/CRP evaluation (PRINCE): a randomized trial and cohort study. Jama 2001;286(1):64-70.

P251 COMPLIANCE AND COMFORT WITH TOPICAL XALATAN APPLICATION WITH XAL-EASE DEVICE

S.S. Sonty[1], G.S. Vangipuram[2], L.L. Belcher[2], A. Ahmad[2]
[1]University of Illinois-Chicago Eye Center, Flossmoor, IL, United States of America, [2]Midwest Eye Center SC, Calumet City, United States of America

Introduction: Compliance among glaucoma patients with application of Glaucoma medications is affected by the infirmities and dexterity of the Glaucoma Patients and/or their relatives in delivering the eye drops. Though many devices were tried including Compliance Monitor computerchip, Compliance cap, spray mode with diagnostic and some therapeutic medications. With the increased cost of the new Prostaglandin medications a device to facilitate single eye drop application is very welcome to prevent overspills and wastage. Xal-Ease is a new Xalatan eye drop delivery device introduced by the then Pharmacia now Pfizer pharmaceutical company to facilitate exact drug delivery to the eye and extend the lifespan of average 2.5ml bottle of average 90 drops to extend beyond 30 days to lessen cost to the glaucoma patients.
Aim of the study: To assess the compliance and comfort of Xal-Ease use in Glaucoma Patients using topical Xalatan.
Methods: 54 Glaucoma Patients from a Glaucoma Practice (SS) were dispensed Xal-Ease Xalatan application device. The patients' acceptance and ease of use were surveyed by a Questionnaire. 47 patients responded. 3 Patients refused to participate and 4 patients could not be reached. Of the 47 patients 26 were African Americans, 19 Caucasians, and 2 Hispanics,. The age ranges 14-88 Years (Mean 65.6 yrs). There were 39 Females and 8 Males. The Questionnaire included History of Comorbid conditions Arthritis & Tremors, Length of Use, Daily Regular Use, User-friendliness, Exact Onedrop or more drops delivery, Reminding nature of device, Patient Expectations and Satisfaction, Continued interest to use, Reduction in Drug refills and cost, Recommendation to others, and development of similar device for other medications.
Results: Among 47 patients 15 had Arthritis and 1 Tremors. The length of use was 1 to 6 months, (Mean 4.1 mths), 33/47 (71%) used it everyday, 14 (29%) did not, 11/47 (23%) felt difficulty to use, 27/48 (58%) did not think as a reminder, 42/47 (89%) said it exceeded their expectations, 41/47 (87%) were satisfied with its efficiency, 42/47 (89%) continued to use the device, 27/47 (57%) experienced reduced cost of refills, 42/47 (89%) were ready to recommend the device to other Glaucoma Patients, and 40/47 (85%) wanted similar device for other glaucoma medications. 13/16 (80%) Arthritis & Tremor Patients were very satisfied with its ease, The 6 Unsatisfied Patients were across all age groups.
Conclusion: Xal-Ease topical Xalatan Applicator was well accepted and was highly recommended by 80% plus of the Glaucoma Patients using the device.
References:
1. Kass MA *et al* Compliance with Topical Pilocarpine Treatment Amer J Ophthalmol 101:515, 1986. **2.** Kooner KS & Zimmerman TJ Clinical Ocular Pharmacology : some overlooked features Ophthalmology Clinics of North America New Ophthalmic Drugs 2:1, 1, 1989. **3.** Sonty S & Ahmad A Differential Compliance with Glaucoma Medications among Glaucoma Patients Abstract American Academy of Ophthalmology - Dallas Meeting (suppl) 232: 2000

P252 REDUCING THE HARMFUL EFFECT OF VARIOUS VEHICLES OF EYE DROPS ON THE SUPERFICIAL CELLS IN THE CENTRAL PART OF RABBIT CORNEA.

P. Follmann[1], M. Jäckel[2], Gy. Soós[3], S. Dikstein[4]
[1]Semmelweis Univ., Faculty of Medicine, Budapest, Hungary, [2]Centr Milit Hosp, Dept Pathol, Budapest, Hungary, [3]Univ of Szeged,Inst of Pharmac, Szeged, Hungary, [4]Resdevco Ltd, Jerusalem, Israel

Purpose: The aim was to compare the scanning electron microscopic (SEM) appearence and size of the central superficial epithelial cells of rabbits of the same bred of timolol maleate 0.5% (Human-Merck) in the conventional vehicle in a vehicle containing glycerine and of various vehicles containing benzalkonium chloride and without benzalkonium chloride. The latter vehicles were missing timolol maleate, the installation was performed b.i.d. for three months in a prospective manner of experiments.
Participants and/or controls: All together 32 pigmented rabbits of the same bred weighing 1000-1500 g were used for instillation, nine animals receiving no eye drops were used as controls.
Methods: The solutions were buffered to pH 7.0. The specimens were prepared for SEM investigation in the usual manner. For SEM a Zeiss 940 electron microscope was used, the pictures were prepared in 20 Ke voltage with magnification 1000x, the pictures were digitalized and cells were surrounded by Scion Image program, and the projection surface of normal cells given in pixels were transduced to µm2. The data were taken to Excel table. The electron microscopic examinations were executed in a double blind manner by two separate investigators. The results of the two investigators did not differ from each other in a significant manner. For statistics Pearson's X2 test and Rank Sum test were used.
Results: There was no significant difference in the data of the controls, between the male and female animals. The results of the investigations are given in the Table.
Conclusions: Replacement of the isotonic saline by isotonic glycerine prevents the epithelial cell damage caused by various vehicles.
References:
1. Abelson B.M., Washburn S.: The downside of preservatives. Review of Ophthalmology 2002; 9: issue 5. **2.** Burnstein N.L.: Corneal cytotoxicity of topically applied drugs, vehicles and preservatives. Surv Ophthalmol 1980; 25: 15-30. **3.** De Saint Jean M., Debbasch C., Brignole F., Warnet J.M., Baudouin C.: *In vitro* toxicity of benzalkonium chloride (BAC) to ocular surface cells and preservative-induced dry eye. Cornea 2000; 19 (Suppl. 2): S 119. **4.** Follmann P., Jäckel M., Soós Gy., Dikstein S.: The effect of timolol maleate (Human-Merck production) and timolol maleate in a moisturizing vehicle on the corneal surface of rabbits. Ophthalmic Research Supplement for the Ever 2001 meeting, October 10-13, Alicante-Spain, Lecture Abstract 1406. **5.** Follmann P., Jäckel M., Soós Gy., Dikstein S.: Reducing the harmful effect of vehicles of eye drops. Ophthalmic Research Supplement for the Ever 2002 meeting, October 2-5, Alicante-Spain, Lecture Abstract 1172. **6.** Pfister R.R., Burstein N.: The effects of ophthalmic drugs, vehicles, and preservatives on corneal epithelium: a scanning electron microscope study. Invest Ophthalmol 1976; 15: 246-259.

12. SURGICAL TREATMENT

P253 THE CLINICAL OUTCOME OF CHINESE PATIENTS TREATED FOR ACUTE PHACOMORPHIC ANGLE-CLOSURE

C.H. Li[1], Y.Y.Y. Kwong[1], Y.L.D. Leung[1], W.F.D. Yick[1], C.Y.C. Tham[2], Y.M.B. Yeung[1], C.C. Chi[1], S.C.D. Lam[2]
[1]Hong Kong Eye Hospital, Hong Kong, Hongkong, [2]DOVS, CUHK, Hong Kong, Hongkong

Purpose: To investigate the clinical outcome of patients with an attack of acute phacomorphic angle closure.
Design: Retrospective case series.
Participants: 20 patients with acute phacomorphic angle closure.
Methods: We reviewed the records of patients who were treated in a tertiary eye centre from the year 2001 to 2002 for acute phacomorphic angle closure.
Main outcome measures: The main outcome measures include visual acuity and intra-ocular pressure control after cataract extraction.
Results: A total of 20 cases were reviewed. All patients were Chinese. There were seven males (35%) and 13 females (65%). The mean age of the patients was 76.2 ± 7.2 years (mean ± standard deviation). The mean duration of symptoms was 3.1 ± 3.5 days. The patients received cataract operation within 5.2 ± 7.4 days from the time of presentation. The majority (85%) of cataracts were extracted with the extracapsular technique, while 15% of patients received phacoemulsification. The majority (90%) of patients received primary intra-ocular lens implantation. Three months after cataract extraction, 60% of patients showed improvement in at least two lines of Snellen visual acuity. One year after the attack, the mean IOP was 13.1 ± 5.4 mmHg., and at least 60% of eyes had IOP below 21 mmHg without the help of anti-glaucomatous medications or filtration surgery.
Conclusion: All of our patients with an attack of acute phacomorphic angle closure from the year 2001 to 2002 received early cataract extraction. Post-operatively, the majority of them showed improvement in visual acuity and had IOP below 21 mmHg.
References:
1. Prajna NV, Ramakrishnan R, Krishnadas R, Manoharan N. Lens induced glaucomas – visual results and risk factors for final visual acuity. Indian J Ophthalmol. 1996 Sep;44(3):149-55. **2.** McKibbin M, Gupta A, Atkins AD. Cataract extraction and intraocular lens implantation in eyes with phacomorphic or phacolytic glaucoma. J Cataract Refract Surg. 1996 Jun;22(5):633-6. **3.** Tomey KF, al-Rajhi AA. Neodymium:YAG laser iridotomy in the initial management of phacomorphic glaucoma. Ophthalmology. 1992 May;99(5):660-5. **4.** Tham CC, Lai JS, Poon AS, Chan JC, Lam SW, Chua JK, Lam DS. Immediate argon laser peripheral iridoplasty (ALPI) as initial treatment for acute phacomorphic angle-closure (phacomorphic glaucoma) before cataract extraction: a preliminary study. Eye. 2004 Sep 10; [Epub ahead of print]

P254 FINGER MASSAGE *VS* A NOVEL MASSAGE DEVICE POST TRABECULECTOMY

P. Gouws[1], Y.M. Buys[1], R. Rachmiel[1], B. Fresco[2], G.E. Trope[1]
[1]Toronto Western Hospital, Toronto, Canada, [2]Private Practice, Toronto, Canada

Purpose: Ocular massage is a common technique employed after trabeculectomy to aid filtration. This pilot study compares a novel new ocular massage device to finger massage post trabeculectomy.
Design: Prospective, randomized clinical trial.
Participants and controls: To date we have recruited 12 patients in each group (24 patients total).
Method: Patients requiring massage within the first 2 weeks post trabeculectomy were prospectively randomized to either finger massage (FM) or massage device (MD). All patients were given a standardized tutorial in ocular massage. The massage device is calibrated to apply a known force to the eye, through the eyelid. When the correct amount of force is applied the device emits an auditory signal. The patient then releases the pressure and repeats this process ten times. This is repeated four times a day. Finger massage was performed in a similar fashion with the patient using their finger instead of the device. The efficiency of their massage technique was evaluated at 1 week by massaging in front of the ophthalmologist with IOP measurement before and after massage. Bleb morphology (evaluated according to the Indiana Grading System[1] comparing to a standard set of photographic prints), IOP and complications were recorded on a weekly basis. The patient perspective was recorded by questionnaire at 1 week; 1 month and 3 months post massage initiation.
Main outcome measures: IOP, bleb morphology, ease of use.
Results: The average age was 58 and 60 (FM and MD) with a male preponderance (7/12 in FM group and 9/12 in MD group). The median IOP in the 2 groups at day 1 and week 1 are shown in Table 1 and demonstrate a tendency for better IOP control with the ocular massager although this does not reach statistical significance in this small sample ($p = 0.31$). Laser suture lysis was performed in 7 (58%) of patients in the FM group *vs* 5 (42%) in the MD group. Wound leaks developed in 2 patients, both in the FM group. Both groups felt equally confident they were doing the massage correctly. Mean pain scores (±SD) were higher in the FM group (4.2 ± 2 *vs* 3.2 ± 2.2).
Conclusion: The massage device shows promise as an adjunctive tool in the post-operative management of trabeculectomies
Reference:
1. Cantor LB, Mantravadi A, WuDunn D, Swamynathan K, Cortes A. Morphologic classification of filtering Blebs after glaucoma filtration surgery: The Indiana bleb appearance grading scale. Journal of Glaucoma 2003; 12 (3): 266-271

P255 THE USE OF CYCLODIODE LASER IN THE TREATMENT OF GLAUCOMA: THE MAYDAY HOSPITAL EXPERIENCE

M. Tsatsos, A. Mandalos, S. Khemka, C. Clark, T. Richardson
Mayday University Hospital, Croydon, United Kingdom

Introduction: Diode laser trans-scleral cyclophotocoagulation (cyclodiode laser) is one of the most widely used methods of ciliary ablation for treatment of refractory glaucoma. The procedure has become increasingly popular in recent years as an alternative to surgical options such as antimetabolite augmented trabeculectomy and tube shunt surgery.
Aims: 1. To compare current practice in cyclodiode laser treatment of glaucoma at Croydon Eye Unit to nationally accepted protocols. 2. To compare two different techniques of treatment: a. Set protocol of laser applications. b. Laser application until clinical end-point.
Methods: Retrospective audit of cyclodiode treatment cases over a 24-month period. Indication for treatment, laser settings, IOP and VA outcomes up to six months postoperatively, adverse events and type of anaesthesia were recorded.
Results: Thirty-one cases of cyclodiode were analyzed. IOP was reduced by 24% at 6 months post-laser. Vision was preserved in most patients. Two cases of anterior uveitis and hypotony were recorded. There were similar IOP and vision preservation outcomes for both techniques of cyclodiode application.
Conclusions: Despite a smaller IOP reduction, we achieved comparable preservation of visual acuity to other national studies. We employed sub-tenon anaesthesia more commonly than other models, which denotes good practice as it is associated with less morbidity. Use of either technique of treatment yielded comparable results.
Having noticed that treatment parameters had not been recorded consistently in patient notes, we decided to introduce a standardized check form for cyclodiode laser.
References:
1. Ulbig MW, McHugh DA, McNaught AI, *et al.* Clinical comparison of semiconductor diode *versus* neodymium:YAG non-contact cyclophotocoagulation. Br. J. Ophthalmol. 79: 569-74, 1995. **2.** Bloom PA, Tsai JC, Sharma K, Miller MH, Rice NS, Hitchings RA, Khaw PT. 'Cyclodiode'. Transscleral diode laser cyclophotocoagulation in the treatment of advanced refractory glaucoma. Ophthalmology 104 (9): 1508-19; discussion 1519-20, 1997. **3.** Spencer AF, Vernon SA. 'Cyclodiode': results of a standard protocol. Br. J. Ophthalmol. 83: 311-316, 1999. **4.** Martin KRG, Broadway DC. Cyclodiode laser therapy for painful, blind glaucomatous eyes. Br. J. Ophthalmol. 85: 474-6, 2001. **5.** Kosoko O, Gaasterland DE, Pollack IP *et al.* The Diode Laser Ciliary Ablation Study Group. Long-term outcome of initial ciliary ablation with contact diode laser transscleral cyclophotocoagulation for severe glaucoma. Ophthalmology 103: 1294-302, 1996. **6.** Hawkins TA, Stewart WC. One-year results of semiconductor transscleral cyclophotocoagulation in patients with glaucoma. Arch. Ophthalmol. 111: 488-91, 1993. **7.** Murphy CC, Burnett CAM, Spry PGD, Broadway DC, Diamond JP. A two centre study of the dose-response relation for transscleral diode laser cyclophotocoagulation in refractory glaucoma. Br. J. Ophthalmol. 87: 1252-7, 2003.

P256 INTRAOCULAR PRESSURE OUTCOME AND VISUAL FIELD ASSESSMENT FOLLOWING ND: YAG IRIDOTOMY IN PRIMARY ANGLE CLOSURE GLAUCOMA

D.V. Dimovska, Dz.E. Dzajkovska, B.K. Blazevska
University Eye Clinic, Skopje, Macedonia

Purpose: To assess the efficacy of Nd: YAG iridotomy as a therapeutical treatment in patients with primary angle closure glaucoma (PACG). The efficacy of the treatment is related to the long term intraocular pressure outcome and assessment of the visual field status.
Methods: The study enrolled 60 patients with PACG who have had undergone Nd: YAG iridotomy as a therapeutical procedure. All of the patients have previously experienced medical treatment which did not succeed to decrease the IOP. The patients were examined for: visual acuity assessment, slit - lamp examination, tonometry, gonioscopy, C / D ratio estimation and visual field examination.
Results: The procedure was performed average in two sessions, with average pulse energy of 4, 4 - 5, 2 mJ. IOP reduction < 20, 0 mmHg was established in 52 patients with mild medical therapy and maintenance of no visual field deterioration during follow up. In three patients IOP ranged in values 24,4 - 29, 0 mmHg, and 5 patients with iridotomy failure due to iridotomy closure have performed filtering surgery.
Conclusions: Nd: YAG iridotomy has proven as a therapeutical method of choice, even as first line therapy in primary chronic angle glaucoma. It is recommended not only in patients with developed glaucoma, but also in patients with occludable angles in order to prevent and avoid following attack of acute angle closure glaucoma.
References:
1. Nd:Yag iridotomy – Updated therapeutic approach in the treatment of angle closed glaucoma Vesna Dimovska, Macedonian Medical Review, 1997. **2.** Laser Techniques in glaucoma treatments Vesna Dimovska, 1st Macedonian Ophtalmology Congress, 2003. **3.** Updated statements referring classification and treatment guidelines in glaucoma E. Dzajkovska, V.Dimovska, K.Blazevska, Oral lecture, Macedonian Ophthalmology Society, 2005

P257 A NEW TITANIUM SAPPHIRE (TISA) LASER ACTIVATED ULTRATHIN GOLD GLAUCOMA DRAINAGE DEVICE (LAGD) FOR THE TREATMENT OF GLAUCOMA

R.M. Kershner, G. Simon
Eye Laser Consulting, Boston, MA, United States of America

Introduction: Laser trabeculoplasty (ALT and SLT) is but one arm in the triad of therapeutic modalities for the treatment of glaucoma, which includes drugs and surgery. In the USA, drugs are often selected as the first line of intervention followed by laser trabeculoplasty, with surgical filtering procedures and glaucoma shunts left as the last line of defense in end-stage glaucoma.
Aim of study: This study was undertaken to evaluate the application of an innovative, new solid-state Titanium:Sapphire Laser (790nm, 7msec, 200um spot size, Solx-TiSa™) to activate a microscopic 24 karat gold drainage device for the surgical treatment of glaucoma (LAGD™).
Methods: Clinical validation of the 790 nm laser device in glaucoma laser trabeculoplasty (GLT) has already been completed at 18 months comparing it with conventional ALT and SLT treatments. In this study, the infrared laser was used to activate an implanted ultrathin 30 micron gold glaucoma drainage device to allow the treating surgeon to titrate the target IOP.
Results: Prior investigations demonstrated that when used alone, the Solx-TiSa laser induced significantly less trabecular thermal tissue damage than ALT or SLT. From baseline to 18 months, average IOP decreased from 29.0 to 17.4 mmHg and the average number of required medications decreased from 3.3 to 1.2. Six month data from the pressure lowering effect of the Solx TiSa™ laser in combination with the gold drainage device demonstrated a synergistic effect allowing for greater reduction in IOP than when either the laser or implant was used alone. Laser application to the implanted Gold Drainage Device resulted in 1-3 mm reduction for each 200 micron spot channel opening.
Conclusions: The Solx TiSa™long wavelength deep penetrating laser offers the potential to decrease intraocular pressure in glaucomatous eyes with less thermal damage and more selectivity than conventional treatments. When used in combination with the 30 micron gold drainage device, the pressure lowering effect of the LAGD treatments was further enhanced by 1-3 mm for each channel opened. The implantable device in combination with the laser, allows the treating surgeon to titrate the target treatment goal for better IOP management.
References:
1. Thermal and Non-Thermal Laser-Trabecular Meshwork Interaction: A scanning electron microscopy Study in Human and Non-Human Primates eyes. Jean-Marie Parel, Viviana Fernandez, Peggy Lamar, Nelson Salas, Fabrice Manns, Susan Decker, Gabriel Simon, Sander Dubovy, Francisco Fantes. (in review). **2.** Biocompatibility of Gold *versus* Polydimethylsiloxane for glaucoma implants. M.A. Orozco1, V.Fernandez1, A.C. Acosta, P.Lamar, S.Dubovy, J.Stoiber, G.Simon, F.Fantes, J.M.Parel1, ARVO, 2004.

P258 ARGON LASER TRABECULOPLASTY COMPARED TO SELECTIVE LASER TRABECULOPLASTY IN PATIENTS WITH OR WITHOUT PRIOR ARGON LASER TRABECULOPLASTY

M. Birt
Sunnybrook & Women's College H.S.C., Toronto, Canada

Purpose: Selective laser trabeculoplasty (SLT) is a new version of laser treatment for lowering intraocular pressure (IOP) in patients with chronic open angle glaucoma. Studies have shown effectiveness as primary therapy; this study was intended to examine results in patients who had had prior argon laser trabeculoplasty (ALT) to 360° of their trabecular meshwork compared to those who had not had ALT and to those having ALT who had not had any prior laser.
Design: Prospective comparison trial.
Participants: One hundred and six patients requiring lower intraocular pressure, for whom laser therapy had been recommended.
Methods: All subjects were given 180 degrees of laser trabeculoplasty. Thirty subjects were having SLT for the first time, 39 were having ALT as their first laser treatment, and 37 were having SLT after having had 360° of ALT therapy previously.
Main outcome measures: Intraocular pressure as recorded prior to the laser and 4.5 months later.
Results: All three groups of patients experienced a statistically significant decrease of IOP at 4.5 months following the laser treatment. However, there were no statistically significant differences between the groups either for prelaser or post laser IOP.
Conclusions: SLT laser can produce a decrease in IOP similar to that obtained by ALT both in patients who have had prior laser treatment and those who have not. SLT may be particularly useful when 360° of ALT have already been performed.
References:
1. Damji KF, Shah KC, Rock WJ, *et al.* Selective laser trabeculoplasty v argon laser trabeculoplasty: a prospective randomised clinical trial. Br J Ophthalmol 1999;83:718-22. **2.** Latina MA, Tumbocon JA. Selective laser trabeculoplasty: a new treatment option for open angle glaucoma. Curr Opin Ophthalmol 2002;13:94-6. **3.** Juzych MS, Chopra V, Banitt MR, *et al.* Comparison of long-term outcomes of selective laser trabeculoplasty *versus* argon laser trabeculoplasty in open-angle glaucoma. Ophthalmology 2004;111:1853-9. **4.** Cioffi GA, Latina MA, Schwartz GF. Argon *versus* selective laser trabeculoplasty. J Glaucoma 2004;13:174-7. **5.** Cvenkel B. One-year follow-up of selective laser trabeculoplasty in open-angle glaucoma. Ophthalmologica 2004;218:20-5.

P259 CLINICAL STUDY OF THE SELECTIVE LASER TRABECULOPLASTY FOR PRIMARY OPEN ANGLE GLAUCOMA: SIX-YEAR FOLLOW UP

K. Koev
Medical University Hospital 'Alexandrov', Sofia, Bulgaria

Introduction: The Selective Laser Trabeculoplasty (SLT) targets only pigmented cells (containing melanin chromophores) from the trabecular meshwork, thus protecting the adjacent non-pigmented cells and tissues from collateral thermal damage.
Purpose: In order to establish the long-term (six-year follow up) laser trabeculoplasty for primary open-angle glaucoma [POAG].
Methods: Trabecular meshwork of 34 eyes (21 patients) with POAG was treated with Q-switched frequency doubled Nd-YAG laser with wavelength of 532 nm Coherent Selecta 7000 (SLT). The eyes were divided in two groups: Group 1: 18 eyes with pigmentation degree in the frontal chamber angle of 1 and 2; Group 2: 16 eyes with pigmentation degree of 3 and 4. The trabecular meshwork with POAG was treated with Q-switched frequency doubled Nd-YAG laser with wavelength of 532 nm – Coherent Selecta 7000. The treatment and follow up period lasted six years, from August 1998 to August 2004. An average of 104 spots on 360 degrees was applied stepwise to the trabecular meshwork of every eye. Each impulse continued 3 nsec, with size of the spot of 400 µm. The IOP was measured before the intervention, one week after it, and periodically, depending on the condition, until the last visit. Besides IOP, also the changes in the front eye segment were monitored through biomicroscopy and gonioscopy, as well as the visual acuity.
Results: Passing inection and eye discomfort in 27% of group 1 and 25% of group 2 were observed in the first two or three days following SLT. After one-week local application of Flucon,

these symptoms were no longer observed in any of the groups. The mean preoperative intraocular pressure [IOP] in group 1 was 25,5±1,5 mmHg, and in group 2: 26±1 mmHg. During the last visit six years after SLT, the mean IOP in group 1 was 18.7±1.4 mmHg. Statistically significant decrease of IOP [p<0.001] was observed after SLT by an average of 6,8 mmHg [26.7%]. During the last visit six years after SLT in group 2, the mean IOP was 18.8±1.2 mmHg. Statistically significant IOP decrease [p<0.001] was observed after SLT by an average of 7.4 mmHg [28.6%].

Conclusion: Our results show that SLT is an effective method of treatment of POAG and that the decrease of IOP of treated eyes is preserved for at least six years.

References:

1. Latina MA. Selective Targeting of Trabecular Meshwork Cells: *In vitro* Studies of Pulsed and CW Laser Interactions. Exper. Eye Res. 1995, 60: 359-372. **2.** Latina MA., Sibayan SA., Shin-DH. Q-switched 532-nm Nd:YAG Laser Trabeculoplasty (selective laser trabeculoplasty): A Multicenter, Pilot, Clinical Study. Ophthalmology. 1998 Nov; 105(11): 2082-8; discussion 2089-90. **3.** Cvenkel B. One-year follow-up of selective laser trabeculoplasty in open-angle glaucoma. Ophthalmologica 2004; 218: 20-25. **4.** Chung-PY., Schuman-JS., Netland-PA. Five-year results of a randomized, prospective, clinical trial of diode *vs* argon laser trabeculoplasty for open-angle glaucoma. Am-J-Ophthalmol. 1998 Aug; 126(2): 185-90. **5.** Pieroth L. Selective targeting may be new glaucoma focus. Ophthalmologye Times, August 1, 1997: 881-882.

P260 SELECTIVE LASER TRABECULOPLASTY COMPARED WITH MEDICAL THERAPY – ONE YEAR FOLLOW-UP

H.F.A. Duijm
Isala Clinics, Zwolle, Netherlands

Purpose: To evaluate the efficacy of selective laser trabeculoplasty compared with medical therapy in ocular hypertension and primary open-angle glaucoma.

Design: Prospective, non-randomized clinical trial.

Methods: In this study 41 patients with ocular hypertension and 34 with primary open-angle glaucoma were first treated with medical therapy (beta blocker or prostaglandin analogue). In 57 patients the target (reduction of intraocular pressure (IOP) with 25% at three months) was reached; they underwent SLT and medical therapy was stopped. SLT was applied to the inferior 180° of the angle, with an average of 50 shots and a total energy of 53 mJ. From 23 patients one eye and from 34 patients both eyes were treated with SLT. Patients were evaluated regularly: at baseline (not treated, including a diurnal IOP curve), monthly during medical therapy and after the SLT. If the IOP on two consecutive measurements did not meet the target pressure, this was defined as a failure.

Main outcome measures: IOP

Results: Without medical treatment (baseline) average (±SD) IOP was 27.7 ± 2.6 mm Hg; with medical treatment 19.1 ± 3.51 mm Hg; at three months after SLT failure rate was 21%; at six, nine and twelve months failure rates were respectively 23%, 24% and 27%. The IOP in the successful SLT patients at three, six nine and twelve months were respectively 19.1 ± 2.1, 18.9 ± 2.0, 18.7 ± 1.9 and 18.8 ± 2.0 mmHg. The difference between medical treatment and SLT was not significantly different at all time points; the difference between baseline and SLT was significantly different (p<0.01). Failures were slightly more frequently observed in lightly pigmented angles.

Conclusions: At one year SLT is effective in 73 % of patients with ocular hypertension or primary open-angle glaucoma patients. It is likely that in these patients SLT is an equally successful treatment modality compared with medical treatment and might be considered as a primary treatment.

References:

1. The Glaucoma Laser Trial Research Group. The Glaucoma Laser Trial (GLT) 2. Results of Argon Laser Trabeculoplasty *versus* Topical Medicines. Ophthalmology 1990; 97: 1403-13. **2.** Latina MA, Park C. Selective Targeting of Trabecular Meshwork Cells: *In vitro* Studies of Pulsed and CW Laser Interactions. Exp Eye Res 1995;60:359-72. **3.** Latina MA, Sibayan SA, Shin DH *et al.* Q-switched 532-nm Nd:YAG Laser Trabeculoplasty (Selective Laser Trabeculoplasty). Ophthalmology 1998;105:2082-90. **4.** Melamed S, Ben Simon GJ, Levkovitch-Verbin H. Selective Laser Trabeuloplasty as Primary Treatment for Open-Angle Glaucoma. Arch Ophthalmol 2003; 121: 957-60. **5.** Chen E, Golchin S, Blomdahl S. A Comparison Between 90 and 180 Selective Laser Trabeculoplasty. J Glaucoma 2004; 13: 62-5. **6.** Juzych MS, Chopra V, Banitt MR, *et al.* Comparison of long-term outcomes of selective laser trabeculoplasty *versus* argon laser trabeculoplasty in open-angle glaucoma. Ophthalmology 2004; 111: 1853-9.

P261 REPEATED LASER GONIOPUNCTURE AFTER NONPENETRATING DEEP SCLERECTOMY

V. Strenev
IRTC Eye Microsurgery, Ekaterinburg, Russian Federation

Objective: Laser goniopuncture (LGP) suggested by Kozlov *et al.*[1] is a safe and effective method of IOP lowering after non-penetrating deep sclerectomy (NPDS) for open-angle glaucoma[1,2]. Nevertheless, IOP after LGP rises in 6 to 10% of cases; sometimes Descemet's membrane looks intact gonioscopically. It was suggested that outflow reduction takes place due to some uninvestigated sclerotic process in the filtering membrane[2]. It might be reasonable to perform repeated LGP in such cases. Purpose of this paper is to analyze the efficacy of repeated laser goniopuncture.

Design: A non-randomized retrospective clinical study.

Patients: Twelve patients (12 eyes) with primary open-angle glaucoma having increased IOP after NPDS and laser goniopuncture were enrolled. Selection criteria were: absence of gonioscopically visible perforation in NPDS zone and significant lowering of IOP after the first DGP. Reoperations were planned on all of them. Mean IOP on hypotensive drops was 37.7 mm Hg (range, 27 to 53).

Intervention: A standard LGP was performed in all the eyes.

Main outcome measures: IOP decrease and avoiding of repeated glaucoma surgery.

Results: In an hour after the procedure IOP became lower in 10 cases, hypertension was marked in 2. In one month mean IOP was 22.2 mm Hg, with an average decrease by 14.1 mm Hg, or 37.4% to the initial level. Only in three eyes reoperations were performed. So, repeated LGP was successful in nine eyes out of 12.

Conclusion: Repeated LGP laser goniopuncture is an effective way of IOP reduction in certain cases of high IOP after NPDS and LGP. In such cases thorough gonioscopy should be performed and, if Descemet's membrane looks intact, repeated laser goniopuncture should be considered before reoperation.

References:

1. Kozlov V I, Magaramov D A, Ereskin NN. Laser treatment of open-angle glaucoma in cases of insufficient compensation of intraocular pressure after non-penetrating deep sclerectomy. Ophthalmosurgery.- 1990.- No. 4.- PP. 62-66. **2.** Mermoud A, Karlen M E, Schnyder C.C. *et al.* Nd:YAG Goniopuncture After Deep Sclerectomy With Collagen Implant. Ophthalmic Surg Lasers.- 1999.- Vol. 30.- PP. 120-125.

P262 EXCIMER LASER TRABECULOSTOMY (ELT): CLINICAL UPDATE

M.S. Berlin[1], J. Funk[2], U. Giers[3], L. Kleineberg[3]
[1]Glaucoma Institute of Beverly Hills, Los Angeles, CA, United States of America, [2]Augenklinikum Universitätsklinik, Freiburg, Germany, [3]University of Dresden, Dresden, Germany

Purpose: To present new clinical trial data on the glaucoma surgical technique: Excimer Laser Trabeculostomy (ELT), which treats the anatomic pathology, juxtacanalicular trabecular meshwork obstruction, in open angle glaucoma.

Methods: Prof. Giers and Prof. Kleinberg conducted a six-month nonrandomized clinical trial comparing the effect of steroids (20 eyes), and NSAID's (20 eyes), in eyes which underwent ELT; and steroids (20 eyes) in eyes which underwent ELT combined with Phaco-CE. Patients were followed for six months postoperatively. Prof. Funk conducted a nonrandomized clinical trial using pooled data from six German centers. 169 eyes of 169 patients underwent ELT combined with Phaco. Patients were followed for at least six months postoperatively. The Main outcome measures for both studies included: efficacy of the procedure; safety of the procedure.

Results: Prof. Giers and Prof. Kleinberg reported a statistically significant mean IOP decrease of 8.5 mm Hg (ELT + steroids), 8.4 mm Hg (ELT + NSAID's), and 9.4 mm Hg (ELT + Phaco-CE + steroids) at six months follow-up. Prof. Funk reported a statistically significant mean IOP decrease of 10.4 mm Hg at 6 months follow-up. No major complications were reported in either study.

Conclusions: ELT is an effective and safe treatment for open-angle glaucoma both alone and in combination with lensectomy.

References:

1. Sourdille P: Study ab interno excimer trabeculotomy shows good IOP lowering effect, stability, Ocular Surgery News Vol. 12, No. 9 (2001). **2.** Berlin, M.S. ELT, Excimer Laser Trabeculostomy Ocular Surgery News Vol. 19, no. 3, Feb 1, 2001 pp. 48-49; Funk J: Phako + ELT, DGII Ludwigshafen (2003). **3.** Berlin M, Funk J, Georgaras S, Giers U, Montrone F, Specht H, Welt R: ELT User Meeting, ESCRS Munich 2003. **4.** Neuhann Th, Scharrer A, Haefliger E: Laser ablation used to treat chronic open-angle glaucoma in pilot study, Ocular Surgery News Vol. 12, No. 11 (2001).

P263 POST SELECTIVE LASER TRABECULOPLASTY (SLT) INTRAOCULAR PRESSURE (IOP) SPIKES IN PIGMENTARY GLAUCOMA: A CASE SERIES WITH ANALYSIS.

P. Harasymowycz[1], D. Papamatheakis[1], M.R. Lesk[1], M. Latina[2], M. DeLeon[2], K. Damji[3]
[1]Université de Montréal, Montréal, Quebec, Canada, [2]Mass Eye and Ear Infirmary, Boston, MA, United States of America, [3]Ottawa Eye Institute, Ottawa, Canada

Purpose: To illustrate the complication of intraocular pressure spikes following selective laser trabeculoplasty (SLT)[1,2] in patients with pigmentary glaucoma, hypothesizing that patients with more advanced disease are more prone to post-selective laser trabeculoplasty intraocular pressure spikes.

Design: Multi-center, nonrandomized, noncomparative, retrospective and interventional case series.

Patients: Four patients (four eyes) with pigmentary glaucoma in four glaucoma subspecialist clinical practices.

Methods: Selective Laser Trabeculoplasty was performed for lowering medically uncontrolled intraocular pressure in these patients. Their postoperative intraocular pressure was monitored.

Outcome measures: Intraocular pressure spikes post-procedure were noted and patients were managed according to physician discretion.

Results: A case series of four patients is presented.

Conclusions: Post-procedural IOP spikes are a serious adverse event in some cases of selective laser trabeculoplasty. Possible causes for the IOP spike include: selective targeting of melanin and pigmented cells or collapse of collagen beams, as well as destruction of reserve pigmented trabecular meshwork cells and risk factors may include advanced TM damage present before the laser therapy, previous argon laser trabeculoplasty treatment and previous IOP spikes with laser iridotomy. Additional studies are needed, to further investigate and clarify this phenomenon.

References:

1. Latina MA, Park C. Selective targeting of trabecular meshwork cells: *in vitro* studies of pulsed and CW laser interactions. Exp Eye Res 1995; 60: 359-71. **2.** Latina MA, Tumbocon JA. Selective Laser Trabeculoplasty: a new treatment option for open angle glaucoma. Curr Opin Ophthalmol 2002; 13: 94-6.

P264 SELECTIVE LASER TRABECULOPLASTY WITH ND:YAG LASER IRIDOTOMY IN PIGMENTARY GLAUCOMA

A. Wrobel, E. Dworenko-Dworkin, K. Przybylska, R. Leszczynski
Silesian School of Medicine, Katowice, Poland

Purpose: To examine the effect of combined procedure: selective laser trabeculoplasty (SLT) pretreated with Nd:YAG – iridotomy (IRT) on the morphology of irido-corneal angle and intraocular pressure (IOP) in patietnts with pigmentary glaucoma (PG).

Methods: Forty two eyes of 21 patients with a diagnosis of pigmentary glaucoma were studied. Average IOP, despite topical farmacotherapy (timolol + dorzolamide), was 25.1 mmHg. Ultrasound biomicroscopy (UBM) was performed in each case before further procedure. Seventeen out of 42 eyes showed iris concavity and iridozonular contact, however 25 eyes did not show increased iris-lens contact in UBM examination. Twenty one eyes, 9 with concave iris inclusive of, were treated with laser iridotomy. Control UBM examinations were done in a week time after IRT. Then all of 42 eyes underwent selective laser trabeculoplasty. Twenty one eyes with only SLT performed made up the control group. IOP was measured after 1 week and 1, 3 and 6 months after trabeculoplasty.

Results: In all nine cases of posterior iris bowing iridotomy flattened the iris and increased the distance from lens. In 12 cases of regular iris UBM did not reveal any changes of irido-corneal morphology. IOP after iridotomy was not significantly lower in both groups. After trabeculoplasty pressure reduction was significant: on average 20.8% (range 0 – 34.1%) during 6 months in both groups with no difference between themselves. Observed complications are described in the paper.

Conclusions: SLT is an effective hypotensive method in pigmentary glaucoma management. Laser iridotomy can be effective prophylactic treatment of reversed papillary block in PG. SLT pretreated with IRT appears not to be significantly more effective than SLT itself in lowering intraocular pressure in PG during first 6 months after treatment but these patients are going to be observed continually.

P265 COMPARISON OF THE SLIT LAMP AND ULTRASOUND BIOMICROSCOPIC FINDINGS OF THE FILTERING BLEB AFTER MMC TRABECULECTOMY BETWEEN WITH FORNIX-BASED AND WITH LIMBUS-BASED CONJUNCTIVAL FLAPS

T. Fukuchi, J. Ueda, K. Yaoeda, H. Hara, Y. Tanaka, H. Abe
Graduated School of Niigata University, Niigata, Japan

Introduction: MMC trabeculectomy with fornix-based conjunctival flap (FB) has a tendency to form flatter, more diffuse and vascularized blebs by comparison with that with limbus-based conjunctival flap. This may be a key to prevent longstanding postoperative complications.

Aim of the study: We compared bleb forms and ultrasound biomicroscopic (UBM) findings after MMC trabeculectomy between with FB and with LB.

Patients and methods: Eighty-six eyes of 86 glaucomatous cases, including POAG, NTG, Exfoliation glaucoma, glaucoma with uveitis and others, underwent MMC trabeculectomy either with FB (39 eyes) or LB (47 eyes). Postoperative intraocular pressure (IOP) was followed up to 36 months. Slit lamp examination and UBM examination were performed between 6 and 12 month postoperative periods.

Results: While postoperative IOP with FB dropped from 21.3 ± 6.7 mmHg preoperatively to 9.64 ± 3.25 mmHg at 12 months, that with LB changed from 22.2 ± 8.8 mmHg to 9.55 ± 3.43 mmHg. Life table analysis by Kaplan-Meyer's method showed probability of success (IOP< 21 mmHg and < preoperative IOP x -20 %) was 88% in FB group and 87•" in LB group after 24 months of the surgery. Additionally MMC trabeculectomy with FB tends to form flatter, more diffuse filtering blebs than that with FI. Capillaries in the bleb with FB have not disappeared completely. By UBM examination, most blebs both with FB and LB showed those in L-type by Yamamoto's classification (Ophthalmology 102: 1770-1776, 1995). While some cases with H-type following MMC trabeculectomy with LB dropped from life-table analysis between 12 and 24 months, those with H-type and FB often kept low IOP for longer periods.
Conclusions: We may be able to make less longstanding complications, such as button hole, bleb leak or postoperative infection, after MMC trabeculectomy by use of FB.
References:
1. Wells AP, *et al*: Ophthalmology 2003: 110; 2192-2197. **2.** Reichert R, *et al*: Ophthalmic Surgery 18: 1987; 672-676. **3.** Murchison Jr JF, *et al*: Am J Ophthalmol 109: 1990; 709-715.

P266 THE DEVELOPMENT OF TRABECULECTOMY FILTER BLEBS – AN ANALYSIS BY SLIT LAMP ADAPTED OPTICAL COHERENCE TOMOGRAPHY
T. Theelen, T.B.F. Hogewind
Radboud University Nijmegen Med.ical Centre, Nijmegen, Netherlands

Introduction: Early postoperative development of filter blebs is critical for the long-term success rates of glaucoma surgery and timely identification of scarring may prevent surgical failure effectively[1]. Slit-lamp adapted optical coherence tomography (SLOCT) is a non-contact device that can illustrate deep tissue layers in the anterior eye segment, which makes it particularly valuable for early postoperative bleb imaging[2].
Aim of the study: To study the development of filter blebs by SLOCT and to compare the results with clinical findings.
Methods: In this prospective, non-randomized trial we studied 15 eyes of 15 patients undergoing primary trabeculectomy with or without use of antimetabolites. In addition to routine clinical examinations, including Goldmann applanation tonometry, participants had slit-lamp photography and SLOCT of the bleb at day 1, week 1, 2, 4 and 12 postoperatively. We analyzed SLOCT results qualitatively and estimated bleb measures and volumes on SLOCT pictures.
Results: All filter blebs could be visualized completely by SLOCT. Higher bleb volume and lower bleb reflectivity was correlated with lower intraocular pressure. Tenon cyst formation was preceded by increased deep tissue reflectivity on SLOCT.
Conclusion: Examination by SLOCT offers additional information about postoperative bleb development. Controlled interventional trials may give further insight in the benefit of these results for the postoperative management of glaucoma surgery.
References:
1. Haynes WL, Alward WLM. Control of intraocular pressure after trabeculectomy. Surv Ophthalmol 1999;43(4):345-355. **2.** Hoerauf H, Wirbelauer C, Scholz C, Engelhardt R, Koch P, Laqua H, Birngruber R. Slit-lamp-adapted optical coherence tomography of the anterior segment. Graefe's Arch Clin Exp Ophthalmol. 2000;238(1):8-18.

P267 DOES SCLERAL FLAP SIZE INFLUENCE INTRAOCULAR PRESSURE CONTROL IN TRABECULECTOMY USING ADJUSTABLE SUTURES?
W. Birchall[1], A.P. Wells[2]
[1]Wellington Hospital, Wellington, New Zealand, [2]Wellington School of Medicine, Wellington, New Zealand

Introduction: Trabeculectomy using a small scleral flap may provide comparable medium-long term IOP control to large flap techniques, and has potential benefits: reduced surgical trauma, larger residual area of virgin sclera and reduced astigmatism induction[1-4]. Tight flap closure with adjustable sutures allows controlled manipulation of IOP post-operatively, minimising hypotony risk and sequelae[5]. We examined the effect on IOP of both large and small flaps using 4-throw adjustable sutures in an experimental model.
Aim of the study: To compare the effect on intraocular pressure (IOP) of large *versus* small scleral flap size during trabeculectomy using adjustable sutures.
Methods: Standardised trabeculectomy operations were performed on nine donor human eyes connected to a constant flow infusion. Baseline IOP was set between 24 and 32mmHg with real-time IOP monitoring. Large scleral flaps (4x4mm, 16mm^2, n=12) or small scleral flaps (3x2mm, 6mm^2, n=9) were constructed over 0.8mm^2 sclerostomies, with evenly distributed sizes. For each procedure, equilibrium IOP was measured following tight closure with two 4-throw adjustable 10-0 nylon sutures; each site was then sealed watertight.
Results: Of the 21 procedures in 9 eyes, five had scleral flaps that were thin or poorly constructed. These had a mean absolute IOP of 7.6mmHg (range 2.7-12.4mmHg) and mean relative IOP of 28.3% of baseline (10-45.8%) after closure. Four of these were in the initial seven procedures, implying learning effect, and four were large flaps. In the remaining 16 high quality procedures in nine eyes, mean IOP was 1.3mmHg (0-3.4mmHg) after sclerostomy, confirming minimal outflow resistance prior to closure. Following flap closure mean IOP was 20mmHg (SD=±4.4, range 15.5-29.3) for large (n=8), and 18.7mmHg (SD=±3.6, 15.9-25.8) for small (n=8) flaps (unpaired *t* test, p=0.26). Mean IOP (% baseline) was 71.6% (SD ±8.4, range 60.6-86.6%) and 66% (SD=±12.7, 46.8-86.6%) for large and small flap groups respectively (unpaired *t* test, p=0.2).
Conclusion: If well constructed, both scleral flap sizes were able to support an average IOP at least two thirds of baseline, and resulted in similar absolute IOP levels. Errors in flap construction resulted in loss of IOP control. Smaller flap size does not appear to compromise control of early post-operative IOP.
References:
1. Starita RJ, Fellman RL, Spaeth GL, Poryzees EM. Effect of varying size of scleral flap and corneal block on trabeculectomy. Ophthalmic Surg 1984;15(6):484-7. **2.** Vernon SA, Spencer AF. Intraocular pressure control following microtrabeculectomy. Eye 1995;9(Pt 3):299-303. **3.** Vernon SA, Gorman C, Zambarakji HJ. Medium to long-term intraocular pressure control following small flap trabeculectomy (microtrabeculectomy) in relatively low risk eyes. Br J Ophthalmol 1998;82(12):1383-6. **4.** Vernon SA, Zambarakji HJ, Potgieter F, *et al*. Topographic and keratometric astigmatism up to 1 year following small flap trabeculectomy (microtrabeculectomy). Br J Ophthalmol 1999;83(7):779-82. **5.** Wells AP, Bunce C, Khaw PT. Flap and suture manipulation after trabeculectomy with adjustable sutures: titration of flow and intraocular pressure in guarded filtration surgery. J Glaucoma 2004;13(5):400-6.

P268 VISUAL OUTCOME ONE YEAR FOLLOWING FILTRATION SURGERY IN END-STAGE GLAUCOMA
F. Topouzis, A. Koskosas, Th. Pappas, E. Anastasopoulos, P. Tranos, S. Dimitrakos
Aristotle University of Thessaloniki, Thessaloniki, Greece

Purpose: To report the one-year results of filtration surgery in a cohort of consecutive patients with end-stage glaucoma.
Design: Prospective interventional, consecutive case-series.
Methods: The study prospectively included consecutive patients with end-stage glaucoma who underwent trabeculectomy with mitomycin-c. Inclusion criteria required preoperative visual field test with Advanced Glaucoma Intervention Study score over 16. Main outcome measures included change in intraocular pressure (IOP), in best corrected LogMAR visual acuity, in mean deviation (MD) of visual field test, in number of points among the four central visual field points with a sensitivity less than 5dB and in mean sensitivity of the four central visual field points following surgery. The incidence of intra-operative and postoperative complications was also recorded. Complete success was defined as an IOP of <18mmHg and >5mmHg without medications and qualified success was defined as an IOP of <18mmHg and >5mmHg with anti glaucoma medications.
Results: Eighteen patients (18 eyes) were enrolled. Mean age was 65 years (range 31-78). Surgery resulted in a reduction of preoperative IOP by 15.2 ± 8.6 mmHg (p<0.001), and a decrease in postoperative anti glaucoma medication use (p<0.001). Complete success at one year postoperatively was 61% and qualified success was 94%. Preoperatively the mean visual acuity was 0.66±0.59, and the mean value of the mean deviation at the visual field test was 28.67 ± 2.8. One year after surgery there was no significant difference in visual acuity (0.56 ± 0.62, p=0.29) and mean deviation (27.87 ± 2.8, p=0.49). Similarly there was no significant change in the visual field parameters tested to assess central visual field sensitivity. There were no intra-operative complications however five cases experienced postoperative leakage and concomitant transient hypotony.
Conclusions: In our case-series of consecutive patients with end-stage glaucoma, followed for one year after filtration surgery vision was preserved and IOP was reduced effectively.
References:
1. Costa VP, Smith M, Spaeth GL, Gandham S, Markovitz B. Loss of visual acuity after trabeculectomy.Ophthalmology.1993;100:599-612. **2.** Kolker AE. Visual prognosis in advanced glaucoma: a comparison of medical and surgical therapy for retention of vision in 101 eyes with advanced glaucoma.Trans Am Ophthalmol Soc.1977;75:539-55. **3.** Aggarwal SP, Hendeles S. Risk of sudden visual loss following trabeculectomy in advanced primary open-angle glaucoma. Br J Ophthalmol.1986;70:97-9. **4.** Lichter PR, Ravin JG. Risks of sudden visual loss after glaucoma surgery. Am J Ophthalmol.1974;78:1009-13. **5.** Martinez JA, Brown RH, Lynch MG, Caplan MB. Risk of postoperative visual loss in advanced glaucoma.Am J Ophthalmol.1993 15;115:332-7. **6.** Levene RZ. Central visual field, visual acuity, and sudden visual loss after glaucoma surgery. Ophthalmic Surg.1992;23:388-94. **7.** The Advanced Glaucoma Intervention Study Investigators. Advance Glaucoma Intervention Study. Visual field test scoring and reliability. Ophthalmology.1994;101:1445-1455. **8.** The Advanced Glaucoma Intervention Study Investigators (AGIS):7. the relationship between Control of Intraocular Pressure and Visual Field Deterioration. Am J Ophthalmol 2000 130;429-440

P269 LONG-TERM PROGNOSIS OF TRABECULECTOMY IN PATIENTS WITH ENDANGERED VISUAL FIELD CENTER.
C. Vass, D. Georgieva, S. Sacu
Medical University of Vienna, Vienna, Austria

Introduction: Several authors have evaluated the risk of sudden vision loss following trabeculectomy. While this risk generally has been found to be small even for patients with far advanced visual field loss, the influence of filtering surgery on the long-term prognosis of patients with severely endangered visual field center is unclear.
Aim of the study: To analyze the long-term prognosis of patients with far advanced glaucoma and compare it to a matched control group with non operated-on patients.
Methods: 407 records of patients with primary open angle glaucoma (POAG), pseudoexfoliation glaucoma (PEX-G), or pigment dispersion glaucoma (PDG) with endangered visual fields (VF) center subjected to their first glaucoma surgery between 1994 and 1998 were screened. One hundred and seventeen eyes of 91 patients were finally included in the surgical group. These patients are compared to a control group with initially equally poor visual fields and similar intraocular pressure (IOP) who did not undergo surgery for various reasons. To grade the amount of central VF loss we developed a grading system based on the central 10°, where the paracentral 4 points and the adjacent 12 points contributed 50% respectively. The maximum score was 24 points.
Main outcome measure: Visual field center loss, vision loss.
Results: 94 eyes had POAG, 21 eyes PEX-G and 2 eyes PDG. At three and 12 months postoperatively and at the end of follow up (42 months ±23) partial glaucomatous center loss occurred in 1,7%, 5.0% and 9.4%, complete glaucomatous center loss occurred in 0%, 0.85% and 6.0% and center loss secondary to other causes occurred in 0%, 0,85% and 8.5%. In multivariate linear regression analysis age, preoperative VF score and VA, postoperative mean IOP and maximum IOP were significant factors. Patients with a score of 19 or more had a 40% risk to develop at least partial VF center loss within one year, compared to 11% risk for patients with score 1 to 18. Patients with PEX-G had a significantly higher risk of VF center loss compared with POAG patients (p=0.049). The results will be compared to the control group of non-operated glaucoma patients with endangered visual field center.
Conclusion: We could confirm the previous finding of a low risk for immediately postoperative VF center loss, even in POAG patients with far advanced glaucomatous VF defects. This risk was however in PEX-G significantly higher and amounted to 10%. Eyes with very severely endangered VF center (score 19-24) had a high risk of vision loss within the first postoperative year. The comparison with the control group will evaluate whether surgery increases or reduces this risk.
References:
1. Thiel HJ *et al.* (2000) Der Ophthalmologe 97:336. **2.** Costa VP *et al.* (1993) Ophthalmology 100:599. **3.** Akafo SK *et al.* (1992) Acta Ophthalmol Copenh 70:312. **4.** Parc CE *et al.* (2001) Am J Ophthalmol 132:27

P270 IN VIVO CONFOCAL MICROSCOPY STUDY OF BLEBS AFTER FILTERING SURGERY
A. Labbe, B. Dupas, P. Hamard, C. Baudouin
XV-XX National Ophthalmology Hospital, Paris, France

Objective: To analyze bleb structure after filtering surgery at the cellular level using a new-generation *in vivo* confocal microscope.
Design: Observational case series.
Participants: We retrospectively evaluated 28 filtering blebs of 24 patients following trabeculectomy or deep non-penetrating sclerectomy.
Methods: Ophthalmologic examinations included slit-lamp examination, applanation tonometry and *in vivo* confocal microscopy (Heidelberg Retina Tomograph II, Rostock Cornea Module). Eyes were classified into three groups: filtering blebs (12 eyes), non-filtering blebs (11 eyes) and filtering blebs after application of mitomycin C (5 eyes). Cellular patterns, morphologic appearance and functional aspects of filtering and non-filtering blebs were compared in a masked manner.
Main outcome measures: *In vivo* confocal microscopy images were analyzed for number of intraepithelial microcysts, density of subepithelial connective tissue, presence of blood vessels or encapsulation.
Results: 83 % of filtering blebs had numerous intraepithelial optically-empty microcysts whereas 82% of non-filtering blebs had none or few. Subepithelial connective tissue was widely spaced in 92 % of filtering blebs whereas it was dense in 91 % of non-filtering blebs. Fibrotic tissue of non-filtering encapsulated blebs was well observed. Filtering blebs with mitomycin C had numerous microcysts and loosely arranged subepithelial connective tissue.
Conclusion: *In vivo* confocal microscopy study of blebs is an original method which agrees well with ex vivo histologic examination. The number of microcysts and density of the subepithelial connective tissue observed with *in vivo* confocal microscopy are correlated with bleb function. By providing details of the structures of filtering blebs at the cellular level, *in vivo* confocal microscopy constitutes a new promising way to understand wound healing mechanisms after filtering surgery.

References:
1. Lachkar Y, Hamard P. Non penetrating filtering surgery. Curr Opin Ophthalmol 2002;13:110-5 **2.** Vesti E. Filtering blebs: follow-up of trabeculectomy. Ophtalmic Surg Lasers 1993;24:249-55 **3.** Picht G, Grehn F. Classification of filtering blebs in trabeculectomy: biomicrocopy and functionality. Curr Opin Ophthalmol 1998;9:2-8 **4.** Powers TP, Stewart WC, Stroman GA. Ultrastructural features of filtration blebs with different clinical appearances. Ophthalmic Surg Lasers 1996;27:790-4 **5.** Addicks EM, Quigley HA, Green R, Robin AL. Histological characteristics of filtering blebs in glaucomatous eyes. Arch Ophthalmol 1983;101:795-8 **6.** Sacu S, Rainer G, Findl O, Georgopoulos M, Vass C. Correlation between the early morphological appearance of filtering blebs and outcome of trabeculectomy with mitomycin C. J Glaucoma 2003;12:430-5 **7.**Jampel HD, McGuigan LJB, Dunkelberger GR, L'Hernault NL, Quigley HA. Cellular proliferation after experimental glaucoma filtration surgery. Arch Ophthalmol 1988;106:89-94 **8.** Shields MB, Scroggs MW, Sloop CM, Simmons RB. Clinical and histopathological observations concerning hypotony after trabeculectomy with adjunctive mitomycin C. Am J Ophthalmol 1993;116:673-83

P271 SUTURELESS GLAUCOMA FILTERING SURGERY IN PRIMARY NARROW ANGLE GLAUCOMA-A 2 YEAR STUDY.

M. Rathi[1], R.C. Nagpal[2], A. Ahuja[3]
Rohtak, India

Objective: Glaucoma affects about 50 million people worldwide and of these, 8 million have been blinded by their disease. Primary narrow angle glaucoma is a more purely pressure dependant disease than primary open angle glaucoma. In advanced cases with extensive synechial closure of the angle, trabeculectomy must be done. Keeping in view the complications of classical trabeculectomy and advantages of sutureless trabeculectomy, we undertook prospective study to evaluate the efficacy and safety of sutureless glaucoma filtering surgery with peripheral iridectomy in the patients of primary narrow angle glaucoma.
Design, Controls, Methods: Patients with angle of anterior chamber closed > 180°, determined gonioscopically, whose IOP was more than 21 mmHg with administration of maximally tolerated medications were recruited for this study. All patients underwent the sutureless scleral tunnel filtering surgery with peripheral iridectomy under peribulbar anesthesia. Intra-operative complications and pre & postoperative visual acuity, IOP, gonioscopy, perimetry, keratometry and bleb status were evaluated for a period of two years.
Results: Surgery was performed in 34 patients (50 eyes) and all the patients completed the follow up. Mean IOP was 31.4 ± 7.98 mm Hg before surgery and 14.46 ± 2.15 mm Hg after surgery over a period of two years. Intraoperatively mild hyphema (4%) and iris prolapse (16%) were the complications managed successfully. Shallow anterior chamber (2%) and hypotony (2%) were the immediate manageable postoperative complications, with conservative treatment. Five patients (10%) had persistently raised IOP > 21 mm Hg postoperatively and were considered failed surgery. The absolute success rate was 90%. A mean decrease of 0.36mm in ocular axial length was observed in 76% patients and 13% increase in AC depth was recorded postoperatively after 6 months of follow up. 36% of the eyes who underwent sutureless scleral tunnel filteration had no astigmatic shift postoperatively while remaining 64% of the eyes had minimal (0.25 D to 1.0 D) postoperative induced astigmatism.
Conclusion: The technique of the sutureless scleral tunnel filteration with peripheral iridectomy in Primary narrow angle glaucoma patients had a high percentage (90%) of success by achieving postoperative control of intraocular pressure, diffuse translucent and avascular bleb, stabilized C: D ratio and visual fields, ≥ visual acuity, increase in anterior chamber depth with hardly any pre-operative or postoperative complications, with minimal or no astigmatism.
References:
1. Quigley H. Results of prevalence studies casts link between ocular pressure and glaucoma in new light. Eurotimes-ESCRS 2003 Jun Suppl. **2.** Quigley H. Worldwide Glaucoma 2000: An Update. Comm Eye Health 2002 Jan; No.33 **3.** Cairns JE. Trabeculectomy preliminary report. Am J Ophthalmol 1968; 66: 673-9 **4.** Gazzard G, Foster PJ, Devereux JG, *et al.* Intraocular pressure and visual field loss in primary angle closure and primary open angle glaucomas. Br J Ophthalmol 2003; 87: 720-5 **5.** Shields MB. Textbook of Glaucoma. 4th ed. Baltimore: Williams & Wilkins; 1998. p. 177-194 **6.** Holladay JT, Dudeja DR, Koch DD. Evaluating and reporting astigmatism for individual and aggregate data. J Cataract Refract Surg 1998; 24:57-65 **7.** Aung T, Tow SL, Yap EY, Chan SP, Seah SK. Trabeculectomy for acute primary angle closure. Ophthalmology 2000; 107 (7): 1298-1302 **8.** Vernon SA, Spencer AF. Intraocular pressure control following microtrabeculectomy. Eye 1995; 9: 299-303

P272 TRABECULECTOMY AND SUPRACILIARY SPACES OPENING SURGERY

Z.J. He, Yu, X.B., H. Yan
Hospital, Tianjin, China

Objective: To find a new security surgery method of lower IOP effect more than conventional trabeculectomy.
Methods: The surgery method: Expose inferior temporal quadrant, like as conventional trabeculectomy, and add a deep sclerectomy at pars plana, then an M shape of Artificial Trabecular Frame (ATF) made in PMMA designed by the author was implanted under the scleral flap. It is called Trabeculectomy and Supraciliary Spaces Opening Surgery (TSSOS) (See fig.1). Nine volunteers with refractory glaucoma and failure cases after trabeculectomy were accepted for this surgery, and follow up for three years at least.
Results: The mean of IOP from preoperative 35.11 ± 5.49mmHg decreased to postoperative 12.78 ± 1.72mmHg (low and high IOP was 10mmHg and 15mmHg respectively in 9 eyes). The vision and visual field of them were improved or no change after surgery. It is show of right eye in a case three years after surgery that the M shape Artificial Trabecular Frame may be seen through the conjunctival and the scleral flap by slit lamp in fig 2.
Conclusions: This is a series study of animal experiments, materials and pre-clinical investigate for ten years. This paper is a part of the pre-clinical investigates only. Prospective research in multi-center will soon start. The advantages of this surgery are as follow: This frame may keep the space under the scleral flap which communicate to the supraciliary space through the hole of deep sclerectomy at pars plana. It is called as Trabeculectomy and Supraciliary Spaces Opening Surgery (TSSOS). The surgery perform on inferiortemporal quadrant not only facility but also infuse a little air easy, which may keep the anterior chamber deep, so the postoperative applications of shallow anterior chamber did not in any case.

P273 INTEROBSERVER VARIABILITY OF THE WUERZBURG BLEB CLASSIFICATION SCORE

T Klink, S Kempter, U Elsesser, J Klink, G Schlunck, F Grehn
Julius-Maximilians-University, Würzburg, Germany

Purpose and design: The Würzburg bleb classification score aims for an objective assessment of the development of filtering blebs after trabeculectomy, in order to detect and treat conjunctival scarring earlier. Purpose of this prospective masked study was to evaluate the interobserver variability in score determination.
Participants and methods: The Würzburg bleb score is a grading scheme for clinical bleb morphology. It evaluates the following parameters: vascularity, corkscrew vessels and encapsulation are each scored from 0-3 as compared to standard photographs. The presence of microcysts is scored 0 to 3 according to thirds of bleb area bearing cysts and bleb height is estimated as multiple of corneal thickness. The total score can be used to guide treatment decisions in postoperative follow-up. Sixty eyes of 57 patients (different times of follow-up: one week after surgery up to one year after surgery) were consecutively examined by three ophthalmologists at different clinical training levels with each observer being unaware of the findings reported by the others. Analysis was performed to determine the variability and agreement between the observers concerning bleb morphology and subsequent therapeutic decisions.
Results: Data analysis showed good levels of agreement. The interclass correlation coefficient for consistency using a 2-way mixed model showed for vascularity +0.65, cork screw vessels +0.67, encapsulation +0.71 and bleb height +0.64. Slightly lower agreement levels were found for microcysts +0.56. The assessment of therapeutical decisions after bleb grading showed a complete agreement of all three observers in 90%, in all other cases at least two observers decided for the same therapy.
Conclusions: The Würzburg bleb classification score allows for standardized filtration bleb analysis with a favourable interobserver variability and consistent therapeutic decision making.
References:
1. Picht G, Grehn F (1998) Classification of filtering blebs in trabeculectomy: biomicroscopy and functionality. Curr Opin Ophthalmol 9:2-8. **2.** Cantor LB, Mantravadi A, WuDunn D, Swamynathan K, Cortes A (2003) Morphologic classification of filtering blebs after glaucoma filtration surgery: the Indiana Bleb Appearance Grading Scale. J Glaucoma 12:266-271. **3**. Sacu S, Rainer G, Findl O, Georgopoulos M, Vass C (2003) Correlation between the early morphological appearance of filtering blebs and outcome of trabeculectomy with mitomycin C. J Glaucoma 12: 430-435. **4.** Crowston JG, Kirwan JF, Wells A *et al.* (2004) Evaluating clinical signs in trabeculectomized eyes. Eye 18: 299-303. **5.** Wells AP, Crowston JG, Marks J *et al.* (2004) A pilot study of a system for grading of drainage blebs after glaucoma surgery. J Glaucoma 13: 454-46

P274 NEW APPROACH TO LIMBUS-BASED TRABECULECTOMY WITH ADJUNCTIVE 5-FU: OBTAINING SHORT LINEAR CONJUNCTIVAL INCISIONS SEPARATED FROM THE TRABECULECTOMY SITE. A RETROSPECTIVE STUDY

D.E. Grigera[1], S. Garcia-Girado[1], H. Fontana[1], E. Morales[1], G. Volpe[2]
[1]Hospital Oftalmologico Santa Lucia, Olivos, Argentina, [2]Centro de Ojos Buenos Aires, Buenos Aires, Argentina

Objective: To describe the results of a modified limbus-based trabeculectomy technique designed to enhance aqueous filtration.
Design: Retrospective, non-comparative interventional case series.
Participants: Sixty-five eyes of 52 patients with uncontrolled glaucoma, submitted to trabeculectomy between 1999 and 2004.
Intervention: A small-length, 6mm conjunctival incision at 10-12mm from the trabeculectomy area is performed, thus minimizing interaction between the two inflammatory processes. A specially designed conjunctival microretractor is used to facilitate access to the limbus through the incision. Intraoperative 5-FU (50 mg/ml, five minutes).
Main outcome measures: Postoperative IOP values, achievement of three different levels of IOP, number of medications, number of postoperative 5-FU injections.
Results: Mean patient age was 64 years (percentil 25=53; percentil 75=69). Diagnosis: 43.07% of the eyes had Primary Open Angle Glaucoma, 24.6% Primary Closed Angle Glaucoma, 12.3% Pseudoexfoliation Glaucoma, 10.7% Juvenile Glaucoma, and Pigmentary , Traumatic and Congenital Glaucomas, 3% each. Median follow-up: 14 months (percentil 25=10; percentil 75=24), range 6 and 70 months. Sixty six percent of the eyes were under three-drug hypotensive treatment, 24% used four drugs, 6.15% two drugs and 3.08% one drug. Cup/disc ratio: <0.5 in 10.8% of the eyes, > 0.5 < 0.8 in 35.4% and > 0.8 in 58.5%. Perimetric damage (Brusini Staging System): 38.5 % of the eyes were stage 0 to 2 and 61.5% were stage 3 to 5. Median of preoperative IOP values under treatment: 24mmHg (percentil 25=20; percentil 75=28) and median of postoperative IOP values: 12mmHg (percentil 25=10; percentil 75=15). Comparison of both mean values by Wilcoxon signed-rank test was z = 7.002; p< 0.00001. With surgery alone an IOP under 21 mmHg could be obtained in 83.07% of the eyes, under 15 mmHg in 67.7% and under 12mmHg in 40%. Including topical medication, 95.38% ended under 21mmHg, 76.92% under 15mmHg and 41.53% under 12mmHg. Twelve eyes received postoperative 5-FU injections and four, a bleb needling procedure. Complications: two eyes had ciliary block glaucoma which resolved; two eyes, clinically detectable choroidal detachment; two, cataracts; three, transient anterior chamber reduction; and one, hyphema.
Conclusions: Hypotensive effect was considered adequate for this group of patients with mainly moderate to severe glaucomatous damage. The procedure had few complications. Prospective, comparative studies are needed.
References:
1. Traverso CE, Tomey KF, Antonios S. Limbal *vs* fornix based conjuntival trabeculectomy flaps. Am J Ophthalm. 1987;104:28-32. **2.** Cohen JS, Osher, RH. Releasable scleral flap suture. Ophthalmol Clin North America 1988;1: 187-197. **3.** The Fluorouracil Surgery Study Group. Five year follow-up of the Fluorouracil Filtering Study. Am J Ophthalmol 1996;121:349-366. **4.** Mora JS, Nguyen N, Iwach A *et al.* Trabeculectomy with intraoperative sponge 5-Fluorouracil. Ophthalmology 1996;103/6:963-971. **5.** Prata JA, Seah SKL, Minckler DS *et al.* Postoperative complications and short-term outcome of 5-fluorouracil or mitomycin-C trabeculectomy. J Glaucoma 1995;4:25-31.

P275 INTERFERON-ALPHA AND INTERFERON-GAMMA SENSITISE HUMAN TENON'S FIBROBLASTS TO MITOMYCIN-C

X.Y. Wang[1], J.G. Crowston[2], H. Zoellner[3], P.R. Healey[4]
[1]Westmead Hospital, Sydney, Australia, [2]Hamilton Glaucoma Center, UCSD, La Jolla, CA, United States of America, [3]Cellular Research Unit, Sydney, Australia, [4]Centre for Vision Research, Sydney, Australia

Purpose: Tenon's fibroblast-mediated subconjunctival scar formation is an important cause of trabeculectomy failure. Mitomycin-C has a potent inhibitory effect on the scarring response. Applications of MMC reduce postoperative scar formation in-vivo and induce Tenon's fibroblast apoptosis *in-vitro*[1]. Interferon-alpha and gamma can inhibit Tenon's fibroblast proliferation and collagen production[2], and prime cells to apoptotic stimuli[3,4]. In search of candidate agents that slow the scarring response and prime cells to subsequent MMC-induced apoptosis, we investigated the effect of interferon pre-treatment on MMC-induced apoptosis.
Methods: Primary Human Tenon's fibroblast (HTF) cell lines generated from Tenon's biopsies were cultured in RPMI medium with different doses of IFN-alpha (1,000U-100,000U) or IFN-gamma (50-500U) for 48 hours. HTF were then treated with 0.4mg MMC for 5 minutes; controls were treated with PBS only. Cell death was determined by flow cytometry (Annexin V/propidium iodide cell labeling) and a lactate dehydrogenase release assay 48 hours after treatment. Fas receptor expression was analysed by flow cytometry.
Results: MMC induced a 5-fold increase in apoptosis at 48-hours compared with untreated cells. The increased apoptosis correlated with upregulation of Fas expression as previously shown[5] in MMC treated cells. Pretreatment with IFN-alpha or IFN-gamma for 48 hours increased Fas expression and significantly increased HTF apoptosis 48-hours after MMC treatment. The increased MMC-induced apoptosis by IFNs was dose-dependant, ranging 40-100% compared with 24-31% apoptosis in non-IFNs pretreated cells.
Conclusions: IFN-alpha and IFN-gamma enhance the susceptibility of HTF to MMC-induced cell death. This is associated with upregulation of Fas expression. Interferon pre-treatment may provide a means for priming fibroblasts to mitomycin-C induced apoptosis.

References:
1. Crowston JG, Akbar AN, Constable PH, *et al.* Antimetabolite-induced apoptosis in Tenon's capsule fibroblasts. Investigative Ophthalmology & Visual Science 1998;39:449-54. **2.** Latina MA, Belmonte SJ, Park C, Crean E. Gamma-interferon effects on human fibroblasts from Tenon's capsule. Investigative Ophthalmology & Visual Science 1991;32:2806-15. **3.** Zella D, Barabitskaja O, Casareto L, *et al.* Recombinant IFN-alpha (2b) increases the expression of apoptosis receptor CD95 and chemokine receptors CCR1 and CCR3 in monocytoid cells. Journal of Immunology 1999;163:3169-75. **4.** Shin EC, Shin WC, Choi Y, *et al.* Effect of interferon-gamma on the susceptibility to Fas (CD95/APO-1)-mediated cell death in human hepatoma cells. Cancer Immunology, Immunotherapy 2001;50:23-30. **5.** Crowston JG, Chang LH, Constable PH, *et al.* Apoptosis gene expression and death receptor signaling in mitomycin-C-treated human tenon capsule fibroblasts. Investigative Ophthalmology & Visual Science 2002;43:692-9.

P276 EFFECTS OF INTRAOPERATIVE INTERCEED AND SURGICEL ON WOUND HEALING REACTION AFTER GLAUCOMA FILTRATION SURGERY

N. Akyol, N. Akpolat
Firat University, Elazig, Turkey

Introduction: Materials that suppress the fibrovascular activity on the glaucoma filtration site are expected to diminish surgical failure by wound healing modulation.
Aim of the study: To evaluate and compare the effectiveness of two oxidized regenerated cellulose material; Interceed and Surgicel on wound healing reaction after glaucoma filtration surgery.
Methods: Trabeculectomy with a limbal based conjunctival incision and a full thickness scleral block excision was carried out by the same surgeon on three groups of rabbits, each consisted of four. Interceed and Surgicel prepared in 2x3 mm dimensions was put on and around of scleral opening in group 1 and 2 respectively. Any material which may interfere with wound healing was not applied in group 3 (control group). Conjunctival closure was provided with 8-0 polyglactin running suture in all eyes. All groups were received tobramycine and dexamethasone drops tid for 14 days. Intraocular pressure, anterior chamber depth and bleb appearance were checked on 1st, 3rd, 7th and 14th days. The rabbits were sacrificed at fourteenth day and the trabeculectomy area with overlying conjunctiva was excised. Histopathologic analysis of the surgical site and surrounding subconjunctival area evaluated by: cell counts (fibroblast, lymphocyte, eosinophyl and macrophage), number of vessels; presence of foreign body reaction and potency of the fistula tract.
Results: There was no statistically significant difference among the groups with respect to intraocular pressure, anterior chamber depth or bleb appearance in any taken day. The number of vessels and eosinophyls in groups 1 and 2 were significantly less than the group 3. Number of the lymphocites was significantly decreased in group 1. There was no statistically significant difference among the groups with respect to number of the fibroblasts, the amount of fibrosis and potency of fistula tract.
Conclusions: This study shows that, both of these adhesion preventing substances seems to suppress vascularisation. In spite of no significant suppression in wound healing reaction after glaucoma filtration surgery, relying on their proven efficacy for preventing adhesions in abdominal and gynaecological surgery, we consider to continue our studies on larger groups.
References:
1. Kook MS, Lee DA. Improving the success of glaucoma surgery by controlling wound healing. Ophthalmology clinics of North America 1995;8:393-399. **2.** Cunliffe IA, Rees RC, Rennie IG. The effect of TGF-beta1 and TGF-beta2 on the proliferation of human Tenon's capsule fibroblasts in tissue culture. Acta Ophthalmol Scand 1996;74:31-35. **3.** Miller MH, Grierson I, Unger WI, Hitchings RA. Wound healing in animal model of glaucoma fistulizing surgery in the rabbit. Ophthalmic Surg 1989;20:350. **4.** Hwang JM, Chang BL. Combined effect of Interceed and 5-fluorouracil on delayed adjustable strabismus surgery. Br J Ophthalmol 1999; 83: 788-91. **5.** Reddy S, Santanam N, Reddy PP, Rock JA, Murphy AA, Parthasarathy S. Interaction of interceed oxidized regenerated cellulose with macrophages: A potential mechanism by which Interceed may prevent adhesions. Am J Obstet Gynecol 1997; 177: 1315-21. **6.** Dimitrijevich SD, Tatarko M, Gracy RW, Wise GE, Oakford LX. *In vivo* degradation of oxidized regenerated cellulose. Carbonhydrate Research 1990; 198: 331-41.

P277 CILIARY BODY TOXICITY OF SUBCONJUNCTIVAL SURAMIN IN COMPARISON TO MITOMYCIN-C IN THE RABBIT EYE: DETERMINATION OF THE TOXIC CONCENTRATION

A. Akman, A. Cetinkaya, G. Take, B. Bilezikci, Y. Akova
Baskent University, Ankara, Turkey

Purpose: This study was carried out to identify the toxic levels of suramin to compare with mitomycin-C (MMC) -as subconjunctival adjunctive agents in trabeculectomy- by investigating the damage in the adjacent ciliary epithelium.
Design: Experimental study.
Participants and controls: Thirty-four New Zealand albino rabbits (32 study eyes and 2 controls)
Methods: Thirty-two New Zealand albino rabbits were randomly distributed into two equal groups to receive either suramin or MMC subconjunctivally in the right eye. Suramin group received 200, 300, 400 and 800 mg/ml injections, and MMC group received 0.2, 0.3, 0.4 and 0.8 mg/ml injections. Two rabbits injected with balanced salt solution served as controls. The groups were further divided into four subgroups and the rabbits were sacrificed at 1st, 3rd, 7th and 28th days. The enucleated globes were bisected vertically. One half of the enuclated globes was put into 10% formaldehyde for light microscopic evaluation and was further processed for apoptosis evaluation. The other half was placed in 2.5% formaldehyde for transmission electron microscopic (TEM) evaluation.
Main outcome measures: Histopathologic evaluation of specimens for determination of toxic concentration of suramin and MMC in the ciliary body.
Results: The pathologic investigation revealed apoptosis in only 4 specimens. All apoptotic specimens were from the MMC group, but there was no relation of apoptosis with a particular MMC concentration. The morphologic evaluation with TEM showed that 200 mg/ml suramin and 0.2 mg/ml MMC did not cause irreversible tissue damage in the ciliary epithelium. Higher concentrations with MMC resulted in rapid and serious tissue damage in the ciliary epithelium, whereas the damage was moderate and it occurred later with suramin in excess of 200 mg/ml.
Conclusions: Suramin 200 mg/ml and MMC 0.2 mg/ml seem harmless to the ciliary body in rabbit eye. Concentrations higher than these values caused irreversible damage.
References:
1. Mietz H, Addicks K, Diestelhorst M, Krieglstein GK. Extraocular application of mitomycin C in a rabbit model: Cytotoxic effects on the ciliary body and epithelium. Ophthalmic Surg 1994; 25:240-244. **2.** Heaps RS, Norlund JR, Gonzalez-Fernandez F, Redick JA, Conway BP. Ultrastructural changes in rabbit ciliary body after extraocular mitomycin-C. Invest Ophthalmol Vis Sci 1998; 39:1971-1975. **3.** Schraermeyer U, Diestelhorst M, Bieker A, Theisohn M, Mietz H, Ustundag C, Joseph C, Krieglstein GK. Morphologic proof of the toxicity of mitomycin C on the ciliary body in relation to different application methods. Graefe's Arch Clin Exp Ophthalmol 1999; 237:593-600. **4.** Mietz H, Chevez-Barrios P, Feldman RM, Lieberman MW. Suramin inhibits wound healing following filtering procedures for glaucoma. Br J Ophthalmol 1998; 82:816-820. **5.** Akman A, Bilezikçi B, Küçükerdönmez C, Demirhan B, Aydýn P. Suramin modulates wound healing of rabbit conjunctiva after trabeculectomy: Comparison with mitomycin C. Curr Eye Res 2003; 26:37-43.

P278 CLINICAL OUTCOME OF TRABECULECTOMY WITH ADJUNCTIVE MITOMYCIN IN PATIENTS WITH ADVANCED GLAUCOMA AND POOR COMPLIANCE WITH MEDICAL ASSESSMENT

M. Eid
Magrabi Eye & Ear Center, Jeddah, 21455, Saudi Arabia

Objectives: To study the clinical outcome of trabeculectomy with intra-operative mitomycin C in patients with advanced glaucoma when presented late in the course of the disease or who are poorly compliant for medical treatment and follow-up.
Design: Retrospective, non-comparative interventional case series.
Participants: Sixty eyes of 54 patients diagnosed with advanced glaucoma due to severe visual field damage and optic disc cupping.
Intervention: All patients were surgically treated by trabeculectomy with mitomycin-C. Patients with significant cataract had combined separate-incision phaco-trabeculectomy.
Main outcome measures: The incidence of surgical complications, IOP reduction, visual outcome, and risk factors for failure to achieve target pressure of 14 mmHg or less.
Results: Six eyes had intraoperative complications whereas 21 eyes had postoperative complications: shallow or flat anterior chamber (25.0%), excessive filtration (21.7%), choroidal effusion (15.0%), and cataract formation or progression (31.0%). Eleven eyes (18.3%) had postoperative surgical intervention. The mean IOP before surgery and at day 1, week 1, month 1, month 3, and last visit examination were 31.8, 16.8, 17.4, 13.6, 13.5, and 12.6 mmHg. Complete surgical success was 50% and qualified success was 33.3% while 16.7% were classified as failure after a mean follow-up of 11 months. Vision improved in 37 eyes, stayed the same in 17 eyes and deteriorated in six eyes. The occurrence of postoperative complications (p=0.05) and previous surgical or laser treatment of glaucoma (p=0.05) were significant predictors of failure to achieve target pressure.
Conclusion: Trabeculectomy with intra-operative mitomycin C application offers a relatively safe and an effective technique to control intraocular pressure to the target level and preserve vision in patients with advanced glaucoma who are less compliant for medical assessment.
References:
1. Anand N, Mielke C, Daeda VK. Trabeculectomy outcomes in advanced glaucoma in Nigeria. Eye 2001;15:274-278. **2.** Eid TM, Spaeth GL, Bitterman A, Steinmann WC. Rate and amount of visual loss in 102 patients with open-angle glaucoma followed up for at least 15 years. Ophthalmology 2003;110:900-907. **3.** Kolker AE. Visual prognosis in advanced glaucoma: a comparison of medical and surgical therapy for retention of vision in 101 eyes with advanced glaucoma. Trans Am Ophthalmol Soc 1977; 75: 539-555. **4.** Shirakashi M, IwataK, Sawaguchi S, *et al.* Intraocular pressure-dependent progression of visual field loss in advanced open-angle glaucoma: a 15-year follow-up. Ophthalmologica 1993; 207:1-5. **5.** Scott IU, Greenfield DS, Schiffman JC, *et al.* Outcomes of primary trabeculectomy with the use of adjunctive mitomycin. Arch Ophthalmol 1998; 116:286-291. **6.** Wilson RP, Steinmann WC. Use of trabeculectomy with postoperative 5-Fluorouracil in patients requiring extremely low intraocular pressure levels to limit further glaucoma progression. Ophthalmology 1991;98:1047-1052. **7.** Bidlish R, Condon GP. Schlosser JD, *et al.* Efficacy and safety of mitomycin-C in primary trabeculectomy. Five-year follow-up. Ophthalmology 2002;109:1336-1342.

P279 INTERFERON-ALPHA AND GAMMA MODULATE FAS MEDIATED APOPTOSIS IN MITOMYCIN-C RESISTANT HUMAN TENON'S FIBROBLASTS

P.R. Healey[1], X.Y. Wang[1], H. Zoellner[2], J.G. Crowston[3]
[1]Centre for Vision Research, Westmead, Australia, [2]Westmead Hospital, Westmead, Australia, [3]Hamilton Glaucoma Center, UCSD, La Jolla, CA, United States of America

Purpose: Mitomycin-C (MMC) induces apoptosis in human Tenon's fibroblasts[1] (HTFs) and variably reduces postoperative scar formation after trabeculectomy. In-vitro MMC-resistance has been reported to correlate with failure of MMC trabeculectomies[2]. Regulable MMC resistance has been reported in skin fibroblasts[3]. Interferon-alpha and -gamma up-regulate Fas expression in fibroblasts and tumour cells and enhance their susceptibility to Fas-induced apoptosis[4,5]. This study investigated the effects of IFN-a and IFN-g on Fas expression and Fas mediated apoptosis in an MMC-resistant primary HTF line.
Methods: An MMC-resistant primary HTF cell line was generated from Tenon's biopsies of a patient undergoing conjunctival surgery. These HTFs were pre-treated with IFN-a (5,000U) and IFN-g (100U) for 48 hours prior to MMC (0.4mg or 5 minutes), and further cultured for 48-hours in the presence of a Fas agonistic antibody (CH11, 50ng/ml). Cell death was determined by flow cytometry using Annexin V/propidium iodide and a lactate dehydrogenase release assay. Cell surface Fas expression was analysed by flow cytometry.
Results: Pre-treatment with IFN-a or IFN-g for 48 hours increased cell surface Fas expression. Combination of IFN-a and IFN-g at the same concentrations resulted in a further increase in Fas expression. MMC treatment alone did not induce significant levels of apoptosis in this resistant fibroblast line, even after pre-treatment with interferons. IFN-a alone had no effect on Fas-induced apoptosis. However IFN-g sensitised the MMC-resistant fibroblast line to Fas stimulating antibody. Anti-Fas induced 40% apoptosis in IFN-g pre-treated fibroblasts and 85% apoptosis in fibroblasts pre-treated with IFN-a and IFN-g.
Conclusions: IFN-a and IFN-g increase Fas expression in HTF and rendered MMC resistant cells sensitive to Fas mediated apoptosis. Further research is required to discover the molecular mechanisms that regulate fibroblast sensitivity to MMC and Fas-induced apoptosis.
References:
1. Crowston JG, Akbar AN, Constable PH, *et al.* Antimetabolite-induced apoptosis in Tenon's capsule fibroblasts. Investigative Ophthalmology & Visual Science 1998;39:449-54. **2.** Madhavan HN, Rao SB, Vijaya L. *et al. In vitro* sensitivity of human Tenon's capsule fibroblasts to mitomycin C and its correlation with outcome of glaucoma filtration surgery. Ophthalmic Surg 1995;26(1): 61-7. **3.** Marshall RS, Paterson MC, Rauth AM. Deficient activation by a human cell strain leads to mitomycin resistance under aerobic but not hypoxic conditions. Br J Cancer 1989;59:341-6. **4.** Santiago B, Galindo M, Palao G, Pablos JL. Intracellular regulation of Fas-induced apoptosis in human fibroblasts by extracellular factors and cycloheximide. Journal of Immunology 2004;172:560-6. **5.** Spanaus KS, Schlapbach R, Fontana A. TNF-alpha and IFN-gamma render microglia sensitive to Fas ligand-induced apoptosis by induction of Fas expression and down-regulation of Bcl-2 and Bcl-xL. European Journal of Immunology 1998;28:4398-408.

P280 THE MORE FLOW SURGERY STUDY: PROSPECTIVE ASSESSMENT OF BLEB MORPHOLOGY, THE RELATIONSHIP TO IOP CONTROL AND THE EARLY BLEB FEATURES THAT PREDICT BLEB FAILURE USING THE NEW MOORFIELDS BLEB GRADING SYSTEM

J.C.K. Clarke[1], D. Minassian[2], P.T. Khaw[1]
[1]Moorfields Eye Hospital, London, United Kingdom, [2]Intitute of Ophthalmology, London, United Kingdom

Introduction: The Moorfields Bleb Grading System[1-3], ratified by the Moorfields Reading Centre, was used to objectively assess the change in photographic appearance of 368 blebs over a four-year period following trabeculectomy[4].The patients had been enrolled into a prospective placebo controlled clinical trial of intraoperative 5FU (the More Flow Surgery Study)[5].
Aim of the study: To determine the influence of intraoperative 5FU on bleb morphology and long term IOP control using the new Moorfields Bleb Grading System.
Methods: The grading system divides the superior conjunctiva and bleb into zones and height, size and vascularuty were described. Failure was defined by the trial criteria. The effect of 5FU on bleb morphology was assessed once the randomisation code was broken.

Results: The majority of blebs were classified as either 50% (moderate size) or 75% (large size) of the standard image area. There was a trend for a reduction in mean intraocular pressure with increasing bleb size. For small blebs the mean IOP = 16.6 mmHg (± 5.83), moderate blebs 14.3 mmHg (SD± 5.97) and large blebs 13.9 mmHg (± 7.02) For each documented bleb size the mean IOP in 5FU group was lower than the placebo group with mean IOP for large blebs with 5FU being 13.1 mmHg (±6.9) and placebo 14.7 mmHg (±7.0) and for moderate sized blebs with 5FU 13.1 mmHg (±5.4) and placebo 15.7 mmHg (±6.2). Moderate to severe vascularity outside of the central bleb zone increases the risk of future failure in the first 6 weeks post operatively. Hazard ratios for future IOP failure increase with the number of weeks that these vascularity scores are graded from 2.89 (95% CI: 1.60 – 5.19) with 2 weeks exposure, to 3.63 (1.61 – 8.14) with 4 weeks exposure and 6.17 (2.19 – 17.40) with 6 weeks exposure. Intraoperative 5FU as an independent covariate does not influence the vascularity of this peripheral bleb zone, however there is an increase in central bleb thinning with 5FU. At 1 year 14% of blebs were graded as cystic in the 5FU group compared to 5.5% in the placebo group.
Conclusion: Larger blebs produce lower IOPs but the range is large. The use of intraoperative 5FU gives a lower IOP for the same sized bleb compared to placebo and central bleb thinning is commoner. Peripheral bleb vascularity is a poor prognostic feature and objective assessment indicates that the risk of future failure increases with prolonged periods of raised vascularity. This simple grading system may be useful in helping to predict future bleb characteristics and IOP outcome.
References:
1. Clarke JCK, Wells *et al.* A System for Grading Filtration Blebs Following Trabeculectomy. Presentation 1201. ARVO 2003. **2.** Marks JR, Wells P, Khaw PT; A Comparison of Two Grading Systems for Filtering Blebs. Invest Ophthalmol Vis Sci (Suppl) 2000 **3.** Wells AP, Crowston JG, *et al.* A Pilot Study of a System for Grading of Drainage Blebs after Glaucoma; J. Glaucoma, 2004, (13) 454-60. **4.** Cairns, J. E. 'Trabeculectomy. Preliminary report of a surgical method of reducing intra-ocular pressure in chronic simple glaucoma without sub-conjunctival drainage of aqueous humor.' Bibl.Ophthalmol. 81 (1970): 143-53. **5.** Khaw PT, The More Flow (Moorfields/ UK MRC) Study: A Randomized Prospective Trial of Intraoperative 5-Fluorouricil *vs* Placebo: Effects on Long-Term Pressure Control and Glaucoma Progression. AAO Annual Meeting 2004.

P281 EVALUATION OF THE TOLERANCE AND EFFICACY OF A FOURTH GENERATION POLY(ORTHO-ESTER) FOR THE PROLONGED RELEASE OF 5-FU AS AN ADJUNCT TO HIGH RISK GLAUCOMA FILTRATION SURGERY: A PILOT STUDY
A.T. Doyle[1], Y. Lachkar[1], O. Felt-Baeyens[2], M. Berdugo[3], R. Gurny[3], F. Behar-Cohen[4]
[1]Fondation Hôpital St. Joseph, Paris, France, [2]Université de Genève, Geneva, Switzerland, [4]INSERM U598, Paris, France

Purpose: The aim of this trial is to determine the efficacy and tolerance of a new generation of biocompatible and biodegradable poly (ortho-esters), POE-IV, as a slow release system for 5FU in the prevention of fibrosis following filtering surgery in a group of patients at high risk of postoperative fibrosis.
Design: Phase I/II clinical trial. Observational case series to determine tolerance, and effective dose.
Methods: Patients with uncontrolled glaucoma, IOP>21mmHg with maximum tolerated medical treatment and at high risk of failure of filtering surgery (two or more risk factors) were included. Five eyes of five patients underwent filtering surgery (four penetrating and one non-penetrating trabeculectomies). Prior to final conjunctival closure 200µl of POE-IV containing 2.4mg of 5FU was injected into the subconjunctival space and the continuous suture closed. Patients were examined at days 1,3,8,15,22,30,60 and 90. Complete success was defined as IOP below 21mmHg without adjunctive medical treatment and qualified success as IOP below 21mmHg with topical antihypotensive drops.
Main outcome measures: 1. Postoperative IOP at three months. 2. Percentage reduction in the IOP at three months. 3. Tolerance: descriptive, based on bleb characteristics, corneal epithelial or endothelial toxicity and conjunctival hyperaemia.
Results: The mean age of the patients was 43.2 years (range 19-66). The mean number of risk factors for fibrosis was 2.2. All but one of the patients had a history of previous failed filtration surgery. The mean preoperative IOP was 27.2mmHg (range 22-39) and the mean number of ocular hypotensive medications was 3. The mean postoperative IOP was was 14.2mmHg (range 9-17) The mean percentage reduction in IOP was 44.8% (range 23-56). There were 3 complete and 2 qualified successes. Side effects included a conjunctival hole in one patient, which resolved spontaneously after two weeks, inferior displacement of the polymer to the inferonasal quadrant causing conjunctival hyperaemia in another patient and inadvertent introduction of the polymer into the anterior chamber in a third patient, with temporary localised corneal oedema which resolved with no loss of visual acuity after removal of the polymer.
Conclusion: The initial results show that POE-IV is an effective system for the slow release of 5-FU for the prevention of scarring following filtering surgery in patients at high risk of surgical failure. Tolerance is reasonable, but further adjustments in the quantity of the polymer and the concentration of the 5-FU are necessary in order to achieve a final volume and concentration which will maintain efficacy whilst improving tolerance.
References:
1. Einmahl S, Behar-Cohen F, D'Hermies F, Rudaz S, Tabatabay C, Renard G, Gurny R. A new poly(ortho ester)-based delivery system for the adjunct treatment of filtering surgery. Investig Ophthalmol Vis Sci 2001;42:695-700. **2.** Einmahl S, Ponsart S, Bejjani RA, D'Hermies F, Savoldelli M, Heller J, Tabatabay C, Gurny R, Behar-Cohen F. Ocular biocomaptibility of a poly(ortho ester) characterized by autocatalyzed degradation. J Biomed Mater Res 2003;67A:44-53. **3.** S.Y. Ng, H.R. Shen, E. Lopez, Y. Zherebin, J. Barr, E. Schacht, J. Heller, Development of a poly(ortho ester) prototype with a latent acid in the polymer backbone for 5-FU delivery, J. Control Rel 2000;65:367-374

P282 THE EFFECT OF TRANILAST EYE DROPS ON RABBIT TENON'S CAPSULE WOUND HEALING
C. He, J. Wang, D. Wang, G. Yan, W. Zhang
The Affiliated Hospital of Qingdao Medic, Qingdao, China

Objective: To investigate the effect of 0.5% tranilast eye drops on alpha 2(I) procollagen and transforming growth factor-β1 (TGF-β1)mRNA expression in rabbit Tenon's capsule.
Methods: Fifteen rabbits were randomly divided into three groups: group tranilast, group vehicle solution and un-treated control group. Alpha 2(I) procollagen and TGF-β1 mRNA in rabbit Tenon's capsule were detected by reverse transcriptase-polymerase chain reaction (RT-PCR) analysis.
Results: The value of alpha 2(I) procollagen/β-actin was 0.880±0.029, 1.034±0.065, 0.808±0.041 for group tranilast, group vehicle solution and un-treated control group respectively. The difference between groups was statistically significant(t=4.808, 3.207, 6.551, P < 0.05). The value of TGF-β1/G3PDH was 0.894±0.058, 0.882±0.090, 0.852±0.061 for group tranilast, group vehicle solution and un-treated control group respectively. Though the value of group tranilast and group vehicle solution was higher than untreated control group, the difference between groups was not statistically significant(t=0.934, 0.667, 0.267, P > 0.05).
Conclusion: 0.5% tranilast eye drops could inhibit alpha 2(!) procollagen mRNA expression in rabbit Tenon's capsule. It can be used as an anti-scarring drug after non-penetrating trabecular surgery.
References:
1. Wang Y, Sun X, Meng F, The failure causes of non-penetrating trabecular surgery and reoperation [J]. Chin. J Ophthalmol, 2003,39(2):87-90.. **2.** Ochiai H, Ochiai Y, Chihara E. Tranilast inhibits TGF- β1 secretion without affecting its mRNA levels in conjunctival cells[J]. Kobe J Med Sci, 2001, 47(5):203-209. **3.** Oshima T, Kurosaka D, Kato K, *et al.* Tranilast inhibits cell proliferation and collagen synthesis by rabbit corneal and Tenon's capsule fibroblasts[J]. Curr Eye Res, 2000, 20(4):283-286. **4.** Chihara E, Dong J, Ochiai H, *et al.* Effects of tranilast on filtering blebs: a pilot study[J]. J Glaucoma, 2002, 11(2):127-133. **5.** Okamoto S, Sakai T, Iwaki Y, *et al.* Effects of tranilast on cultured rabbit corneal keratocytes and corneal haze after photorefractive keratectomy[J]. Jpn J Ophthalmol, 1999, 43(5):355-362. **6.** Goto Y, Nishiyama M, Miyata H, *et al.* Studies on the metabolic fate of tranilast ophthalmic solution: ocular distribution, absorption and excretion after a single and repeated ophthalmic instillation in guinea pig and rabbit eyes[J]. Yakubutu-Doutai. 1993, 8:151–164. **7.** Ikeda H, Inao M, Fujiwara K. Inhibitory effect of tranilast on activation and transforming growth factor beta 1 expression in cultured rat stellate cells[J]. Biochem Biophys Res Commun, 1996, 227(2): 322–327. **8.** Tripathi RC, Li J, Chalam KV, *et al.* Expression of Growth Factor mRNAs by Human Tenon's Capsule Fibroblasts. Exp. Eye Res, 1996, 63(3): 339-346. **9.** Cordeiro MF. Role of transforming growth factor beta in conjunctival scarring[J]. Clin Sci (Lond), 2003, 104(2): 181–187

P283 THE EXPERIMENTAL STUDY OF THE EFFECTS OF INTERFERON-GAMMA GENE ON TENON'S CAPSULE FIBROBLASTS IN VITRO
L. Lan
Hospital, Guangzhou, China

Objective: To investigate the effects of the interferon-gamma (IFN-gamma) gene on human Tenon's capsule fibroblasts *in vitro*.
Design: Experimental study.
Methods: Using lipofectAMINE, IFN-gamma gene was transferred in human Tenon's capsule fibroblasts with plasmid pcDNA3IFN-gamma *in vitro*. The transfected fibroblasts were screened by G418. Its expression was determined by RT-PCR•Cimmunohistochemistry and Flow cytometry assay respectively. The effects of IFN-gamma on Tenon's capsule fibroblasts were evaluated by Flow cytometry assay and MTT.
Results: The Tenon's capsule fibroblasts transferred the IFN-gamma gene can express the IFN-gamma in transcription by RT-PCR and in protein level by immunohistochemistry and Flow cytometry assay respectively. The proliferation of the fibroblasts transferred the IFN-gamma gene was inhibited with MTT and Flow cytometry.
Conclusion: The proliferation of the Tenon's capsule fibroblasts *in vitro* was inhibited by IFN-gamma gene.
References:
1. Khaw PT. Antiproliferative agents and prevention of scaring after surgery: friends or foe? Br J Of Ophthalmol, 1995, 79:627. **2.** Devos R, Cheroutre H, Taya Y, *et al.* Molecular cloning of human immune interferon cDNA and its expression in eukaryotic cells. Nucleic Acids Res, 1982, 10:2487-2501. **3.** Sihota R, Dada T, Gupta SD, *et al.* Conjunctival dysfunction and mitomycin C-induced hypotony. J Glaucoma, 2000, 9: 392-397. **4.** Singh K, Mehta K, Shaikh NM, *et al.* Trabeculectomy with intraoperative I intraoperative mitomycin C *versus* 5-fluorouracil. Prospective randomized clinical trial. Ophthalmology, 2000, 107: 2305-2309. **5.** Latina MA, Schwartz GS, Blemonte SJ, *et al.* the Effects of G-IFN on growth and wound close of tenon's capsule fibroblasts. Invest Ophthalmol Vis Sci, 1990, 31:86-89. **6.** Nguyen KD, Hoang At and Lee DA. Transcriptional control of human tenon's capsule fibroblast collagen synthesis *in vitro* by gamma-interferon. Invest Ophthalmol Vis Sci, 1994, 35: 3064-3070.

P284 INHIBITORY EFFECT OF TRANILAST ON COLLAGEN SYNTHESIS AND TGF-BETA2 EXPRESSION IN HUMAN LAMINA CRIBROSA ASTROCYTES
Yang Cao[1], YZ Hu[1], BH Da[1], J Li[2], Y Shui[3], HR Wei[1]
[1]Union Hospital,Tongji Medical College, Wuhan, China, [2]University of Virginia, Salem,VA, United States of America, [3]Washington University, St. Louis, MO, United States of America

Purpose: To study the effect of tranilast on collagen synthesis and TGF-β2 expression in cultured human lamina cribrosa astrocytes.
Design: Experimental study.
Participants and/or controls: Primary cultures of human lamina cribrosa cells were generated from four normal donors. Only astrocytes cultures which were glial fibrillary acidic protein positive were used for further experiments. Human lamina cribrosa astrocytes of passage three were plated in each well of a 96-well disk and grown to confluence. Tranilast was added into the fresh incubation medium to final concentration of 0 µg/ml (control), 12.5 µg/ml, 25 µg/ml or 50 µg/ml 24 hours after confluence. Four cultures were used at each concentration.
Methods: Fourty eight hours after incubation, collagen synthesis of the cultured human lamina cribrosa astrocytes was quantified by measuring the amount of the 3H-proline incorporated into the cells by a scintillation counter. In addition, the relative levels of expression of TGF-β2 were examined by using semi-quantitative reverse transcription polymerase chain reaction (RT-PCR) with glyceraldehyde-3-phosphate dehydrogenase (G3PDH) as an internal control.
Main outcome measure: Uptake of 3H-proline by human lamina cribrosa astrocytes; ratio of TGF-β2/G3PDH PCR products signal intensities.
Results: Compared with the control group, incorporation of 3H-proline into human lamina cribrosa astrocytes were significantly decreased by tranilast at concentrations of 12.5 µg/ml ($p<0.05$), 25 µg/ml ($p<0.05$) and 50 µg/ml ($p<0.01$) in a dose-dependent manner (Fig.1). And there was statistical significant difference between the ratio of TGF-β2/G3PDH PCR products signal intensities in the experimental groups treated with tranilast at 25 µg/ml ($p<0.01$) and 50 µg/ml ($p<0.01$) and that of the control group. 12.5 µg/ml tranilast did not affect the ratio significantly (Fig.2).
Conclusion: Our current study demonstrated that tranilast inhibits the collagen synthesis and TGF-β2 mRNA expression in cultured human lamina cribrosa astrocytes. In view of the involvement of excess collagen and TGF-β2 in the remodeling of the extracellular matrix in the optic nerve head of primary open-angle glaucoma, our results indicate that tranilast may be a potential therapeutic agent in the treatment of this blinding disorder.
References:
1. Fuchshofer R, Birke M, Welge-Lussen U, *et al.* Transforming growth factor-beta 2 modulated extracellular matrix component expression in cultured human optic nerve head astrocytes.Invest Ophthalmol Vis Sci 2005;46:568-78. **2.** Fukuchi T, Ueda J, Hanyu T, *et al.* Distribution and expression of transforming growth factor-beta and platelet-derived growth factor in the normal and glaucomatous monkey optic nerve heads. Jpn J Ophthalmol 2001;45:592-9. **3.** Pena JD, Taylor AW, Ricard CS, Vidal I, Hernandez MR. Transforming growth factor beta isoforms in human optic nerve heads. Br J Ophthalmol 1999;83:209-18. **4.** Yasukawa T, Kimura H, Dong J, *et al.* Effect of tranilast on proliferation, collagen gel contraction, and transforming growth factor beta secretion of retinal pigment epithelial cells and fibroblasts. Ophthalmic Res 2002;34:206-12. **5.** Ikeda H, Inao M, Fujiwara K. Inhibitory effect of tranilast on activation and transforming growth factor beta expression in cultured rat stellate cells. Biochem Biophys Res Commun 1996;227:322-7. **6.** Hernandez MR, Andrzejewska WM, Neufeld AH. Changes in the extracellular matrix of the human optic nerve head in primary open-angle glaucoma. Am J Ophthalmol 1990;109:180–8.

P285 PRIMARY RECONTRUCTION OF THE FILTERING BLEB
A. González García[1], E. Ortiz González[2]
[1]Neurology and Neurosurgery Institute, Ciudad Habana, Cuba, [2]Ramón Pando Ferrer, Ciudad Habana, Cuba

Objective: To document the safety and effectiveness of one year postoperative of remodeling the filtering bleb.
Design: Prospective, non comparative case series.
Participants: Thirty patients who underwent fornix-based trabeculectomy were included in the study. The nature of this procedure was explained to all participating patients who signed informed consent forms prior to undergoing the surgery.
Intervention: Each trabeculectomized patient with failed filtering bleb underwent surgical repair using conjunctival advancement with little inter patient variation and was followed for one year.
Main outcome measures: Symptoms, intraocular pressure and bleb morphology.
Results: Thirty eyes of 30 patients seen with failed filtering blebs were recruited. Seventeen eyes (56.66%) were dissecting blebs, five (16.66%) were encapsulated blebs and eight (26.66%) were leaking blebs. The mean intraocular pressure in the group of encapsulated blebs was reduced from 22.2 mmHg (confidence interval [CI] 20.4, 23.9 P=0.0004) to 17 mmHg (CI 15.77, 18.23 P=0.0004). In leaking blebs the mean intraocular pressure raised from 8.25 mmHg (CI 6.88, 9.62 P=0) to 16.87 mmHg (CI 15.62, 18.12 P=0). The failed filtering blebs were fixed in 27 eyes (90%). All patients with non effective reconstruction (10%) were from the dissecting blebs group.
Conclusions: From this preliminary study the primary surgical remodeling of the failed filtering blebs seems to be effective and safe.
References:
1. Siegfried CJ, Grewal RK, Karalekas D, Rosenberg LF, Krupin T. Marked intraocular pressure rise complicating intrableb autologous blood injection. Arch ophthalmol.1996; 114: 492. **2.** Hawkins AS, Flanagan JK, Brown SVL. Predictors for success of needle revision of failing filtration blebs. Ophthalmology 2002; 109: 781-785. **3.** Burnstein AL, WuDunn D, Knotts SL, Catoira Y, Cantor LB. Conjuntival advancement *versus* nonincisional treatment for late-onset glaucoma filtering bleb leaks. Ophthalmology 2002; 109: 71-75. **4.** Greenfield DS, Liebmann JM, Jee J, Ritch R, Late-onset bleb leak after glaucoma filtering surgery. Arch Ophthalmol 1998; 116: 443-447. **5.** Ulrich GG, Proia AD, Shields MB, Clinicopathologic features and surgical management of dissecting glaucoma filtering blebs. Ophthalmic Surg Lasers 1997; 28(2):151-155. **6.** Schwartz AL, Van Veldhuisen PC, Gaasterland DE, Ederer F, Sullivan EK, Cyrlin MN, AGIS Investigatiors. The Advanced Glaucoma Intervention Study (AGIS): 5. Encapsulated bleb after initial trabeculectomy. Am J Ophthalmol 1999;127:8-19. **7.** Blok MD, Kok JH, van Mil C, Greve EL, Kijlstra A. Use of the Megasoft Bandage Lens for treatment of complications after trabeculectomy. Am J Ophthalmol. 1990;110(3):264-8.

P286 RISK FACTORS FOR BLEB INJECTION FOLLOWING GLAUCOMA FILTRATION SURGERY
J. Ueda, T. Fukuchi, K. Yaoeda, Y. Tanaka, K. Suda, H. Hara, M. Shirakashi, H. Abe
Niigata University, Niigata, Japan

Introduction: Scarring of the filtering bleb is a major cause of bleb failure after trabeculectomy, and bulbar injection is a symptom in the early postoperative stage. Predisposing factors of the eyes and surgical procedures were retrospectively analysed.
Aim of the study: To evaluate the underlying risk factors for bleb injection after glaucoma filtration surgery.
Methods: One hundred eighty four eyes of 170 patients who underwent trabeculectomy with mitomycin C between January 2003 and October 2004 were surveyed. One hundred thirty eyes were enrolled in injected-bleb group, which required additional use of tranilast to relieve the hyperemia and subconjunctival fibrosis. Background factors of the operated eyes and surgical procedures were evaluated by logistic regression analysis concerning the incidence of postoperative bleb injection. P value (P) and risk ratio (RR) with 95% confidence interval (CI) were assessed.
Results: Two factors out of nine were statistically significant, (1) elder patients compared with younger patients (P, 0.006; RR, 0.40; CI, 0.21-0.77) and (2) surgical history in the upper half of the eye (P, 0.043; RR, 2.627; CI, 1.03-6.69). Other factors were as follows, (3) gender: male *versus* female (P, 0.889; RR, 1.065; CI, 0.44-2.61), (4) type of glaucoma: primary *versus* secondary (P, 0.69; RR, 0.843; CI, 0.37-1.95), exfoliation glaucoma *versus* others (P, 0.186; RR, 2.173; CI, 0.69-6.87), neovascular glaucoma *versus* others (P, 0.337; RR, 2.046; CI, 0.48-8.81), uveitic glaucoma *versus* others (P, 0.113; RR, 0.414; CI, 0.14-1.23), (5) experienced operator *versus* non specialist (P, 0.168; RR, 0.471; CI, 0.16-1.38), (6) number of eye drops before operation (P, 0.874; RR, 1.053; CI, 0.56-1.99), (7) duration of the eye drop treatment for glaucoma (P, 0.826; RR, 0.992; CI, 0.92-1.07), (8) conjunctival suture: 9-0 silk *versus* 10-0 nylon (P, 0.123; RR, 0.455; CI, 0.17-1.24) and (9) conjunctival incision: limbal-based *versus* fornix-based (P, 0.802; RR, 0.840; CI, 0.22-3.27).
Conclusion: Incidence of bleb injection decreased with age, and increased with past history of ocular surgery. Although statistically insignificant, exfoliation glaucoma and neovascular glaucoma predisposed to early bleb failure, and conjunctival suture with 10-0 nylon showed less effect on scarring compared with 9-0 silk.
References:
1. Schwartz AL, Van Veldhuisen PC, Gaasterland DE, *et al.* The advanced glaucoma intervention study (AGIS): 5. Encapsulated bleb after initial trabeculectomy. Am J Ophthalmol. 1999 Jan; 127(1):8-19. **2.** Edmunds B, Bunce CV, Thompson JR, *et al.* Factors associated with success in first-time trabeculectomy for patients at low risk of failure with chronic open-angle glaucoma. Ophthalmology. 2004 Jan;111(1):97-103. **3.** Yarangumeli A, Koz OG, Kural G. Encapsulated blebs following primary standard trabeculectomy: course and treatment. J Glaucoma. 2004 Jun;13(3):251-5. **4.** Edmunds B, Thompson JR, Salmon JF *et al.* The national survey of trabeculectomy. II. Variation in operative technique and outcome. Eye. 2001 Aug;15(Pt4):441-8. **5.** AGIS investigators. The advanced glaucoma intervention study (AGIS): 11. Risk factors for failure of trabeculectomy and argon laser trabeculoplasty. Am J Ophthalmol. 2002 Oct;134(4):481-98.

P287 FIXATION LOSS AFTER TRABECULECTOMY IN PATIENTS WITH ADVANCED GLAUCOMATOUS VISUAL FIELD DEFECT
T. Koga, M.O. Ogata, M.A Awai, T.M. Muto, T.I. Inoue, M.I. Inatani, H.T. Tanihara
Kumamoto University, Kumamoto, Japan

Objective: To elucidate risk factors related to fixation loss after trabeculectomy in patients with advanced glaucomatous visual field defect (VFD).
Patients and methods: Included were 100 eyes of 75 glaucomatous patients with advanced glaucomatous VFD. Trabeculectomy alone was performed in 65 eyes. In the remaining 35 eyes, phacoemulsification, aspiration and implantation of an intraocular lens (PEA+IOL) were combined with trabeculectomy simultaneously (triple procedure). The mean age (± standard deviation) was 68.2 ± 9.1 years old.
Results: In three (3%) of the 100 glaucomatous eyes with advanced glaucomatous VFD, irreversible loss of fixation (central vision) occurred. In two of the three eyes, fixation loss was found within two weeks after trabeculectomy. In the remaining one eye, fixation was lost at one month after surgery. Our statistical analysis did not show significant difference in age, gender, general disorders, preoperative visual acuity. In contrast, preoperative intraocular pressure (IOP) in fixation loss group, 29.3 ± 7.6 mmHg (n=3), was significantly higher than that in control group, 22.3 ± 6.3 mmHg (n=97) (p<0.05). Also, preoperative mean deviation (MD) value in fixation loss group, -29.9 ± 2.0, was significantly different from that in control group, -26.0 ± 3.3 (p<0.05). Another risk factor was combination of PEA+IOL with trabeculectomy. In all of the 3 eyes with fixation loss, the triple procedure (PEA+IOL+trabeculectomy) was performed.
Conclusions: From our results, we conclude that combination of cataract surgery with trabeculectomy may be a noteworthy risk factor to the onset of fixation loss. Much attention should be paid to glaucomatous patients with high IOP levels and advanced reduction in MD value.
References:
1. Costa VP, Smith M, Spaeth GL, Gandham S, Markovitz B. Loss of visual acuity after trabeculectomy. Ophthalmology 100: 599-612, 1993. **2.** Martinez JA, Brown RH, Lynch MG, Caplan MB. Risk of postoperative visual loss in advanced glaucoma. Am J Ophthalmol 115: 332-337, 1993. **3.** Levene RZ. Central visual field, visual acuity, and sudden visual loss after glaucoma surgery. Ophthalmic Surg 23: 388-394, 1992. **4.** Aggarwal SP, Hendeles S. Risk of sudden visual loss following trabeculectomy in advanced primary open-angle glaucoma. Br J Ophthalmol 70: 97-99, 1986. **5.** Kolker AE. Visual prognosis in advanced glaucoma: a comparison of medical and surgical therapy for retention of vision in 101 eyes with advanced glaucoma.

P288 PENETRATION OF LEVOFLOXACIN INTO THE AQUEOUS HUMOR OF EYES WITH THIN-WALLED BLEBS
L.Y Qiao, N.L Wang, S.Q. Zhu, Y.B. Liang, Q.J Lu, X.H. Wan
Tong Ren Eye Center, Bei jing, China

Objectives: To determine concentrations of levofloxacin in aqueous humor after topical administration in eyes with thin-walled blebs.
Methods: A prospective, randomized, control comparative study involving 15 eyes with thin-walled blebs and 15 control eyes of 30 patients who were to undergo cataract surgery. All patients received topical levofloxacin installation of one drop of 0.3% ophthalmic solution every 30 minutes, beginning four hours before surgery, with the last dose administered 30 minutes before surgery. Aqueous samples (0.1~0.2ml) were withdrawn during surgery, and the levofloxacin content of all aqueous samples was measured by high-performance liquid chromatography (HPLC).
Results: The concentration of levofloxacin in the aqueous was 3.7 ± 2.3ug/ml in thin-walled bleb group and 0.4 ± 0.2 ug/ml in controlled one, and the difference was statistically meaningful with the P value being 0.000.
Conclusions: Levofloxacin penetrates better in that with thin-walled blebs than in controlled one, by which levofloxacin in thin-walled bleb group reaches more than 9-fold greater concentration than does in controls. The thin-walled bleb maybe a passageway that the topical ophthalmic solution penetrate into eyes.

P289 INITIAL CLINICAL EXPERIENCE WITH NEW GLAUCOMA DRAINAGE DEVICE
V.P. Erichev, A.M. Bessmertny, O.V. Robustova
Helmholtz Institute of Eye Diseases, Moscow, Russian Federation

Purpose: To estimate the efficacy a new glaucoma drainage device (GDD) in refractory glaucoma treatment.
Design: Interventional case series.
Participants: Eleven eyes of 11 patients (mean age 60.5±7.6 years, range, 43-68 years) were operated: six eyes with neovascular glaucoma, two with pseudophakic glaucoma, two with primary multioperated glaucoma and one with iridocorneal endothelial syndrome (Cogan-Reese).
Intervention: GDD designed in collaboration with Investigation Center of Biomaterials from Scientific Research Institute of Transplantology and Artificial Organs. The GDD consist of 2 microtubules inserted in the body in the size 5.0x3.5x2.0 mm. Microtubules are executed from polypropylene with internal diameter 200 microns, thickness of a wall 25 microns, external diameter 250 microns and diameter pore 0.02-0.04 microns. The body is made of a microporous copolymer HEMA (26%) with the fixed contents of water (74%). The body carries out function of the valve as at increase of intraocular pressure (IOP) it starts to pass an aqueous due to limited sorptive capacities of hydrogel. Before implantation approximately on half of length the section of GDD lengthways on two parts is made. Surgical procedure included trabeculectomy, cyclodialysis in 3 mm from limbus and implantation of GDD in such a manner that the part with acting microtubules is inserted through a fistula into the anterior chamber, and divided part under scleral flap and in cyclodialysis.
Main outcome measures: Visual acuity, IOP, number of anti glaucoma medication was recorded.
Results: The mean follow-up was 11.0±2.7 months (range, 6-15 months). There were no significant intra-operative complications in any patients. The most common complications were hyphema (4 cases) and choroidal detachment (three cases). There was no instance of marked decrease in visual acuity after surgery. The number of glaucoma treatments dropped from 2.3±0.5 to 0.5±0.8. At the final follow-up visit, IOP was within the normal range in nine eyes and was over normal in two eyes.
Conclusions: Preliminary results indicated that trabeculectomy with cyclodialysis and implantation new GDD is safe and effective for reduce IOP in intractable glaucoma. Long-term results and larger study is required to confirm these observations.
References:
1. Assaad M.H., Baerveldt G., Rockwood E.J. Glaucoma drainage devices: pros and cons. Curr Opinion Ophthalmol. 1999, 10, 147-153. **2.** Lim K.S., Allan B.D.S., Lloyd A.W. *et al.* Glaucoma drainage devices; past, present, and future. Br J Ophthalmol. 1998, 82, 1083-1089.

P290 THE AHMED SHUNT *VS.* THE BAERVELDT SHUNT FOR REFRACTORY GLAUCOMA: COMPARISON OF LONGER TERM OUTCOMES OF A SINGLE SURGEON
J.C. Tsai[1], C.C. Johnson[2], J.A. Kammer[2], M.S. Dietrich[2]
[1]Harkness Eye Institute, Columbia Univ., New York, NY, United States of America, [2]Vanderbilt University, Nashville, TN, United States of America

Introduction: Multiple studies have been conducted to determine the efficacy of intraocular pressure (IOP) control following implantation of Ahmed and Baerveldt shunts in refractory glaucoma. Relatively fewer papers have looked at the longer term outcomes of these procedures.
Aim of study: To determine longer term surgical success rates and IOP profiles of a previously reported cohort of patients who underwent Ahmed or Baerveldt shunt implants. Secondary outcomes included analysis of the number of medications used and the occurrence and timing of postoperative complications.
Methods: The records of 118 consecutive glaucoma implant procedures (70 Baerveldt, 48 Ahmed) performed by a single surgeon between July 1996 and June 2000 were retrospectively analyzed.
Results: At 48 months post-surgery, no difference was found in the survival rates of the Ahmed and Baerveldt implants. The median time to failure was 3.2 months for the Baerveldt shunts compared to 15.0 months for the Ahmed implants (p=0.009). While no differences in IOP profiles were noted after week 1, patients with the Baerveldt shunt implants required fewer glaucoma medications at 18, 24, 30, and 36 months post-surgery (all p<0.05).
Conclusion: The Ahmed and Baerveldt implants have comparable longer term surgical outcomes.
References:
1. Tsai JC, Johnson CC, Dietrich MS. Ophthalmology 2003; 110: 1814-1821. **2.** Syed HM, Law SK, Nam SH, *et al.* J Glaucoma 2004; 13: 38-45. **3.** Coleman AL, Hill R, Wilson MR, *et al.* Am J Ophthalmol 1995; 120: 23-31. **4.** Lloyd ME, Baerveldt G, Fellenbaum PS, *et al.* Ophthalmology 1994; 101: 1456-1463. **5.** Topouzis F, Coleman AL, Choplin N, *et al.* Am J Ophthalmol 1999; 128: 198-204.

P291 EARLY POSTOPERATIVE IOP RISE AFTER IMPLANTATION OF THE NEW FLEXIBLE AHMED GLAUCOMA VALVE

G.T. Georgopoulos[1], D. Papaconstantinou[1], A. Maragos[1], J. Apostolakis[1], M. Moschos[1], E. Patsea[2]
[1]Athens University Medical School, Athens, Greece, [2]Ophthalmiatrion Eye Hospital, Athens, Greece

Introduction: Artificial shunt devices have long been used in the treatment of refractory glaucoma. In the University Department of Ophthalmology in Athens we have a solid experience in the use of the Ahmed Glaucoma Valve. We prefer it for its adequate control of the intraocular pressure (IOP) without complications, such as excessive draining.
Aim of the study: A new flexible Ahmed Glaucoma Valve has been recently introduced. Our purpose was to determine its efficacy and safety.
Methods: The new flexible Ahmed Glaucoma Valve was inserted superotemporally in 32 eyes of 31 patients with refractory glaucoma that were operated in our department. The type of glaucoma was neovascular in 23 eyes, pseudophacic in six eyes and inflammatory in two eyes. None of the eyes had previously received an artificial shunt device or other glaucoma surgery. No conjunctiva was scarred or otherwise compromised before surgery.
Results: In the early postoperative period the valve tube in the anterior chamber remained patent in all eyes. No operative or early post-operative (hyphaema, anterior chamber collapse, choroidal detachment) complications were encountered. The IOP was well controlled during the first three weeks following the operation. However, three to six weeks after surgery an IOP rise ranged from 24 to 32 mmHg, was observed in six patients (18.75%). In these eyes IOP was significantly reduced after application of intense ocular massage and in two out of six eyes no other treatment was necessary. However, the remaining 4 eyes required topical glaucoma medications.
Conclusion: The insertion of the new flexible Ahmed Glaucoma Valve was a safe procedure, but showed a relative high percentage of early postoperative IOP rise. At this stage, fibrosis cannot be the cause. We postulate that the new valve body (silicone instead of polypropylene) make it susceptible to compression by drained aqueous humor in the sub-conjunctival space above the valve resulting in properties change of the elastomer membrane. The increased tension on this membrane might be responsible for the IOP rise.
References:
1. Bhatia, Lini S. M.D.; Chen, Teresa C. M.D: New Ahmed Valve Designs. Int Ophthalmol Clin. 2004;44(1):123-38.

P292 PRIMARY SINGLE PLATE MOLTENO TUBE IMPLANTATION FOR CHILDHOOD GLAUCOMA ASSOCIATED WITH STURGE-WEBER SYNDROME

H. Amini[1], R. Zarei[1], M. Razeghinejad[2], B. Esfandiarpour[1]
[1]Farabi Eye Hospital, Eye Research Centre, Tehran, Iran, [2]Khalili Hospital, Shiraz, Iran

Introduction: Sturge-Weber syndrome is a rare phacomatosis characterized by facial hemangioma (usually unilateral and ipsilateral racemose leptomeningeal hemangioma)[1]. It is estimated that glaucoma affects 30% of patients with SWS[2,3,4,5]. Filtering procedures have risk of serious complications such as expulsive choroidal hemorrhage, vitreous loss, bleeding from episcleral vessels, prolonged flat anterior chamber, and choroidal effusion[1], Complications may be minimized by Molteno tube implantation because of the tube ligature with absorbable suture that prevents early postoperative hypotony. The efficacy and complications of Molteno tube implantation in controlling the glaucoma in children with SWS have not been reported previously.
Aim of the study: To evaluate the safety and efficacy of primary single plate Molteno tube implantation in the management of childhood glaucoma associated with sturge-weber syndrome.
Methods: Nine eyes of seven patients were included in this interventional non-comparative case series.
Results: The average age of seven patients at the time of the surgery was 9.6 ± 3.7 years (range; 5-17 years). Intraocular pressure reduced from 34.2 ± 8.3 mmHg preoperatively to 21.2 ± 7.3 mmHg at the last follow-up visit (p=0.012). Five eyes (55.5%) maintained a postoperative intraocular pressure <21 mmHg with and without medications at the last visit with a mean follow up of 32 ± 4.7 months (range, 20-36 months). The number of medications used for the control of glaucoma reduced from 3.4 ± 0.5 to 2.2 ± 1.3 (p=0.058). There was no intraopertive complication. Postoperatively, three eyes (33.3%) developed choroidal effusion necessitating drainage, one eye (11%) cataract and one eye (11%) retinal detachment. At the last follow-up in five eyes (55.5%) visual acuity was the same as preoperative value and in none of them vision improved.
Conclusion: Primary Molteno tube implantation appears to be a relatively useful modality of surgery in the eyes with glaucoma resulting from sturge- weber syndrome.
References:
1. Budenz DL, Sakamoto D, Eliezer R,*et al.* Two-staged Baerveldt glaucoma implant for childhood glaucoma associated with sturge-weber syndrome. Ophthalmology 2000; 107(11): 2105-2 **2.** Iwach AG, Hoskins HDJr, Hetherington J Jr, *et al.* Analysis of surgical and medical management of glaucoma in sturge-weber syndrome. Ophthalmology 1990; 97: 904-9. **3.** Van Emelen C, Goethals M, Dralands L,*et al.* Treatment of glaucoma in children with sturge-weber syndrome. J Pediatr Ophthalmol Strabismus. 1992; 29: 349-356. **4.** Mandal AK. Primary combined trabeculotomy-trabeculectomy for early-onset glaucoma in sturge-weber syndrome. Ophthalmology 1999; 106(8): 1621-27. **5.** Sidoti PA, Belmonte SJ, Liebmann JM, *et al.* Trabeculectomy with mitomycin-C in the treatment of peadiatric glaucomas. Ophthalmology 2000; 107: 422-9.

P293 CLINICAL EXPERIENCE WITH THE AHMED GLAUCOMA VALVE IMPLANT IN REFRACTORY GLAUCOMA

H.J. Lee, K.R. Choi
Mokdong Hospital, Ewha Womans University, Seoul, South-Korea

Introduction: Glaucoma drainage implants have become an important method if controlling intraocular pressure.
Aim of the study: To assess the efficacy, safety, and clinical outcomes of the Ahmed Glaucoma Valve Implant in refractory glaucoma.
Methods: We retrospectively studied 55 eyes of 51 patients who underwent Ahmed Glaucoma Valve implantation for refractory glaucoma unresponsive to the conventional management. Mean follow-up period was 26.3 ± 11.5 months. Success was defined as an intraocular pressure between 5 and 21 mmHg regardless of glaucoma medication, and with no additional glaucoma surgery, phthisis, or loss of light perception.
Results: The reduction of intraocular pressure and the number of glaucoma medications were both statistically significant(p<0.0001). The 1-year and 2-year success rate were 82.4% and 75.6%, respectively. The complications included hyphema in nine eyes, hypotony with temporary choroidal detachment in four eyes, tube obstruction in three eyes, tube malposition in two eyes, and bullous keratopathy in two eyes.
Conclusions: Ahmed Glaucoma Valve implant may provide good intraocular pressure control in patients with refractory glaucom unresponsive to conventional methods.
References:
1. A Clinical Study of the Ahmed Glaucoma Valve Implant in Advanced Glaucoma. Ayyala RS, Zurakowski D, Smith JA, *et al.* Ophthalmology 1998;105:1968-1976. **2.** Long-term follow-up of Primary Glaucoma Surgery With Ahmed Glaucoma Valve Implant *Versus* Trabeculectomy. Wilson MR, Mendis U, Paliwal A, Haynatzka V. Am J Ophthalmol 2003;136:464-470. **3.** Intermediate-term Clinical Experience With the Ahmed Glaucoma Valve Implant. Huang MC, Netland PA, Cloeman AL, *et al.* Am J Ophthalmol 1999;127:27-33. **4.** Follow-up of the Original Cohort With the Ahmed Glaucoma Valve Implant. Topouzis F, Coleman AL, Choplin N, *et al.* Am J Ophthalmol 1999;128:198-204. **5.** Management of Uveitic Glaucoma with Ahmed Glaucoma Valve Implantation. Mata AD, Burk SE, Netland PA.

P294 THE FACTORS ASSOCIATED WITH THE SUCCESS OF AHMED GLAUCOMA VALVE IMPLANTATION

C.S Kim, Y.W. Lee, Y.G. Xu
Chungnam National University Hospital, Daejon, South-Korea

Purpose: Since glaucoma implant surgery was introduced by Rollett and Mareau[1], there have been many modifications of the implant design. Molteno[2] established the idea of posterior tube shunt surgery, and Krupin[3] introduced restrictive valve implant. This study aimed to evaluate the clinical factors associated with the success of implantation of Ahmed Glaucoma Valve (AGV)[4,5], one of the restrictive drainage implant in treatment of refractory glaucoma.
Design: Retrospective comparison of case series between success and failure group after AGV implantation.
Participants: Fifty eyes of 45 patients who underwent AGV implantation to treat refractory glaucoma. Nineteen secondary glaucomas, 18 neovascular glaucomas, and eight failed trabeculectomy cases were enrolled.
Methods: The success criterion was a postoperative intraocular pressure (IOP) between 6 and 21 mmHg with or without anti-glaucoma medication. The failure criteria were as follows; the IOP was out of control on the two consecutive visits with anti-glaucoma medications, and additional glaucoma surgery or surgical intervention was needed to treat devastating complications. We compared various clinical factors between success and failure group.
Main outcome measure: To find variable that affected the success rate of AGV implantation
Results: The mean follow-up was 15.4 months (range, 6~31 months). Thirty-three eyes (73.3%) were classified as a success and 12 eyes (26.7%) were classified as a failure at last visit. The Kaplan-Meier cumulative success was 91.1% at one month, 79.7% at six months, and 71.1% at 12 months. The success rate of the surgery was significantly greater in male, patient who got surgery at the supero-temporal side, and patient who showed non-respondence to the steroid solution in the fellow eye than in female, supero-nasal site of surgery and steroid responders. The other clinical factors such as age, right or left eye, phakia or pseudophakia, systemic disease such as diabetes and hypertension, preoperative intraocular pressure, preoperative number of anti-glaucoma medications, and the number of previous glaucoma surgery or other ocular surgery showed no difference between success and failure group.
Conclusion: The efficacy of lowering the IOP of AGV implant would be expected to be greater in male patient, and if the patient is a non-responder to the steroid test. And given the same situation on both supero-temporal and supero-nasal area, AGV is better to be implanted at supero-temporal quadrant to increase the success rate.
References:
1. Rollett M, Moreau M. Traitement du hypopyon par le drainage capillaire de chamber anterieure. Rev Gen Ophthalmol 1906;35:481. **2.** Molteno ACB. New implant for drainage in glaucoma. Clinical trial. Br J Ophthalmol 1969;53:606-15. **3.** Krupin T, Podos SM, Becker B. Valve implants in filtering surgery: a preliminary report. Am J Ophthalmol 1976;81:232-5. **4.** Tam MYM *et al*: Preliminary results of glaucoma valve implant clinical trial, Invest Ophthalmol Vis Sci 1994; 35(suppl):1914. **5.** Huang MC, Netland PA, Coleman AL, *et al.* Intermediate-term clinical experience with the Ahmed glaucoma valve implant. Am J Ophthalmol 1999;127:27-33

P296 A MICROTRABECULAR BYPASS STENT FOR OPEN ANGLE GLAUCOMA PATIENTS

F. De Feo[1], C.E. Traverso[1], F.M. Honrubia Lopez[2], P. Jacobi[3], J.G. Sanchez[4], H. Hoh[5], S. Gandolfi[6]
[1]Clinica Oculistica University of Genova, Genova, Italy, [2]Hospital Miguel Servet, Zaragoza, Spain, [3]University of Cologne, Cologne, Germany, [4]Clinico San Carlos, Madrid, Spain, [5]Klinikum Neubrandenburg, Neubrandenburg, Germany, [6]University of Parma, Parma, Italy

Introduction: A multi-center nonrandomized open-labeled study of a total of 45 patients across six sites with uncontrolled open angle glaucoma, who were on maximum tolerated medical therapy and had undergone a previously failed conventional glaucoma surgical procedure.
Aim of the study: To evaluate in refractory open angle glaucoma patients the efficacy and safety of the Glaukos iStent™ that allows the aqueous humor to directly enter Schlemm's canal by bypassing the resistant trabecular meshwork[1].
Methods: The initial 45 patients underwent ab-interno gonioscopically guided implantation of the iStent™. The Main outcome measures used at all follow up visits were IOP, visual acuity and glaucoma medication.
Results: The data showed that for the subjects with previous/failed trabeculectomy, 77.8% reached an IOP of <21mmHg 50% of these patients were not taking medications during a mean follow up period of 3.97 months. The subjects with previous/failed ALT, 64% achieved an IOP of <21 mmHg with 43% of these subjects not taking medications during a mean follow up period of 3.97 months. There were no complications and minimal adverse events compared to traditional filtration surgery.
Conclusion: The goal of glaucoma therapy is preservation of visual function with minimal or no side effects[2]. Due to the complications with surgery, it has been usually performed at late stages in the disease after medical and laser treatments have failed[3]. A device that would reliably bypass the trabecular meshwork is potentially advantageous for early use in the disease process[3]. The preliminary results of this study do indicate that the ab-interno implantation of the iStent™ represents a new therapeutic approach to significantly reducing IOP and /or medical drug regimens with minimized intra-operative and postoperative complications as seen in traditional surgery for patients with OAG.
References:
1. Zhou J PhD, Smedley G PhD. A Trabecular Bypass Flow Hypothesis. Journal of Glaucoma 14(1):74-83, Feb. 2005. **2.** European Glaucoma Society. Terminology and Guidelines for Glaucoma, Second Edition, Savona, Italy:Dogma Srl:2003. **3.** Bahler C, Smedley G PhD, *et al* Trabecular Bypass Stents Decrease Intraocular Pressure in Cultured Human Anterior Segments. AJO. December 2004;138(6):988-944

P297 DEEP SCLERECTOMY WITH S-K GEL *VERSUS* DEEP SCLERECTOMY WITH MITOMYCIN C IN OPEN ANGLE GLAUCOMA.

M. Elsebaay Shahin, K. Kolkailah, H. El-Nahas, A. Anwar
Faculty of Medicine Suez Canal Univ., Ismailia, Egypt

Introduction: Various therapies, including medication, laser trabeculoplasty, and different types of surgeries have been used to prevent progressive glaucomatous damage. At present, conventional filtering surgery remains the mainstay of microsurgical therapy for the management of glaucoma not controlled by medications[1,2,3]. Deep sclerectomy is a non-penetrating filtering procedure used for the surgical treatment of open angle glaucoma as an alternative to trabeculectomy with advantages of decreased postoperative complications. Non-penetrating deep sclerectomy is indicated for intra ocular pressure (IOP) normalization in any form of open angle glaucoma. S-K Gel is a hyluronate implant used as space maintainer device under the superficial flap of during deep sclerectomy while Mitomycin C is an antimetabolite used over the sclera to prevent episcleral proliferation and fibrosis[4,5].
Purpose: To compare between the results of non-penetrating deep sclerectomy with the use of S-K Gel (hyluronate implant) and non-penetrating deep sclerectomy with the use of Mitomycin C 0.5 %

Methods: Twenty eyes of 20 patients with open angle glaucoma were subdivided into two groups 10 eyes for each. In the first group deep sclerectomy was done with the use of S-K Gel under the superficial scleral flap where in the other group deep sclerectomy was done with the use of Mitomycin C 0.5% over the sclera before the dissection of superficial flap. IOP was measured in the first postoperative day, after 1 week, 1 month, 3 months, 6 months, 9 months and 12 months.
Results: The mean preoperative IOP in the first group was 27.7 mmHg where it was 28.4 mmHg in the second group. The mean postoperative IOP at the end of follow-up period was 17.16 mmHg in the first group where it was 14.40 mmHg in the second group. The difference in IOP decline between the two groups was statistically significant. The complete success was 60 % in the first group however it was 80 % in the second.
Conclusion: Deep sclerectomy with Mitomycin C was superior to deep sclerectomy with S-K Gel in surgical treatment of open angle glaucoma.
References:
1. Brubaker RF. Measurement of aquous flow by fluorophotometry. *In*: Ritch R, Shields MB, eds. The glaucomas, Vol I. St Louis, MO: Mosby, 1989: 337-44. **2.** El Sayyad F, Helal M, El-Kholify H *et al.* Non-penetrating deep sclerectomy *versus* trabeculectomy in bilateral primary open angle glaucoma. Ophthalmology 2000; 107: 1671-74. **3.** Kim CY, Chang HR, Lee JH *et al.* Surgical outcomes of deep sclerectomy with collagen implant. Korean J Ophthalmol 2001; Vol.15:107-112. **4.** Hamel M, Sharaawy T, Mermoud A. Deep sclerectomy with collagen implant in glaucomatous patients with high myopia. In: European Glaucoma Society millennium meeting 2001. London, UK. **5.** Yamin TN, Quentin JR. Results of deep sclerectomy with the use of Mitomycin C. Ophthalmic Surg 2002; 15: 722-26.

P298 POST OPERATIVE MANAGEMENT AFTER NON-PENETRATING GLAUCOMA SURGERY

D. Kazakova[1], C. Schnyder[2], A. Mermoud[2]
[1]First City Hospital, Sofia, Bulgaria, [2]Jules Gonin Eye Hospital, Lausanne, Switzerland

Introduction: Non-penetrating glaucoma surgery preserves the integrity of the trabecular meshwork and lowers the intraocular pressure (IOP) without penetrating the anterior chamber. The principal common concept of non-penetration is to create filtration through a naturally occurring membrane that acts as an outflow resistance site, which allows a progressive drop in IOP.
Aim: The purpose of this study is to follow up the postoperative period of the patents after non-penetrating glaucoma surgery when the intraocular pressure (IOP) is not sufficient enough.
Methods: Forty four eyes of 33 patients with medically uncontrolled open angle glaucoma after deep sclerectomy were sudied. Postoperatively 16 eyes had Goniopuncture with Nd:YAG laser. Six eyes had postoperative subconjunctival injection of Mitomycin C because of intraocular pressure increase. Two patients had a needling procedure after surgery.
Results: Intraocular pressure decreased significantly in twenty patients from 28.1 ± 2.5 mmHg to 12.4 ± 3.8 mmHg. In 24 patients the IOP was not sufficient enough and additional procedures were needed.
Conclusion: Non-penetrating glaucoma surgery is a safe procedure and has fewer complications after surgery compared to standard trabeculectomy. However, in half of the patients additional procedures were needed in order to normalize Intraocular pressure (IOP).
References:
1. Chio AGY, Mermoud A, Underdahl JP, Schnyder CC (1998) – An ultrasound biomicroscopy study of eyes after deep sclerectomy with collagen implant. Ophthalmology 105:746-750. **2.** Kazakova D, Rotesrs S, Schnyder C, Achache F *et al.* – Ultrasound biomicroscopy images: long-term results after deep sclerectomy with collagen implant. Graefe's Arch Clin Exp Ophthalmol (2002) 340:918-923. **3.** Chiou AGY, Mermoud A, Daniel A, Jewelewicz (1998) Postoperative inflammation following deep sclerectomy. Graefe's Arch Clin Exp Ophthalmol 236:593-596.

P299 VERY HIGH PREOPERATIVE INTRAOCULAR PRESSURE DOESN'T AFFECT DEEP SCLERECTOMY EFFICACY

F. Marcoli, D. Minetti
Istituto Clinico Mater Domini, Castellanza, Italy

Purpose: Even if many studies have demonstrated the long term efficacy of deep sclerectomy (DS)[1-3], nowadays there is no agreement about the role of DS in most serious glaucoma cases[4,5]. We investigated the relation between preoperative intraocular pressure (pIOP) and medium term results, in order to assess if higher pIOP value could jeopardize DS efficacy.
Design: Retrospective, comparative non randomized interventional study, involving consecutive patients.
Participants: We retrospectively examined the charts of 89 eyes affected by glaucoma uncontrolled by medication and submitted to uncomplicated DS. We divided the eyes in three groups, according to the pIOP: group 1 (59 eyes), slightly high pIOP, >20 mmHg, ≤ 27 mmHg, mean pIOP value 24.2 mmHg, mean number of drugs 2.7; group 2 (22 eyes), high pIOP, > 28 mmHg, ≤ 38 mmHg, mean pIOP value 32.8 mmHg, mean number of drugs 3.5; group 3 (8 eyes), very high pIOP, ≥ 38 mmHg, mean pIOP value 40.4 mmHg, mean number of drugs 4.0.
Intervention: All the eyes were submitted to uncomplicated DS with collagen implant.
Main outcome measures: For each eye we analyzed the IOP value and the number of drugs, before, one and two years after surgery. We also assessed the qualified and complete success rate in every group.
Results: One year after DS, mean IOP value was respectively 10.9, 10.8 and 11.8 mmHg in group 1, 2 and 3; two years after, mean IOP value in the three groups was 11.9, 9.5 and 11.9 mmHg. The mean number of drugs was 0.2, 0.2 and 0.1 respectively in group 1, 2 and 3, one year after surgery, and 0.4 in every group two years after. One year after DS, group 1 achieved 84.8% of absolute success, while group 2 had 90.9% , and group 3 had 87.5%. At two years examination, the absolute success rate was 66.1% in group 1, 73.3% in group 2, and 66.6% in group 3. Qualified success was achieved for every eye at the end of the study.
Conclusions: In our series, postoperative IOP values, need for medications and success rates were similar in all groups. DS with collagen implant appears to provide satisfactory results apart from preoperative IOP values, and to be suitable for very high preoperative IOP glaucoma cases too.
References:
1. Shaarawy T *et al*: Long-term results of deep sclerectomy with collagen implant. J Cataract Refract Surg 2004;30:1225-1231 **2.** Lachkar Y *et al*: Nonpenetrating deep sclerectomy: a 6-year retrospective study. Eur J Ophthalmol. 2004 Jan-Feb;14(1):26-36. **3.** Mermoud A *et al*: Comparison of deep sclerectomy with collagen implant and trabeculectomy in open-angle glaucoma. J Cataract Refract Surg 1999;25(3):323-31 **4.** Gandolfi S: Deep sclerectomy *vs* trabeculectomy. Prospective randomised clinical trial : 4-year interim analysis. 'Glaucoma 2003', Greek Glaucoma Society, Athens, February 21 - 12, 2003 **5.** Interview with RN Weinreb. Eurotimes Vol 9, May 2004, 6-7.

P300 ULTRASOUND BIOMICROSCOPY OF DEEP SCLERECTOMY WITH COLLAGEN IMPLANT COMPARED TO VERY DEEP SCLERECTOMY WITH COLLAGEN IMPLANT: A RANDOMIZED CONTROLLED TRIAL

K. Mansouri, H.V. Tran, C.C. Schnyder, E. Ravinet, F. Achache, A. Mermoud
Jules Gonin Eye Hospital, Lausanne, Switzerland

Purpose: To compare the intraocular pressure lowering effect and safety of an innovative variant of deep sclerectomy, the very deep sclerectomy (VDSCI) with collagen implant to conventional deep sclerectomy (DSCI) with collagen implant.
Design: Randomized Controlled Trial.
Participants: Fifty patients.
Methods: Fifty patients with medically uncontrolled primary and secondary open-angle glaucoma were included in the study. Randomly, 25 patients were assigned to undergo either DSCI or VDSCI procedure. The patients were examined before and after the operation at 1-D, D-1, 1, 2, 3 weeks and 1, 3, 6, 9, and 12 months. UBM examination was done at 3 and 6 months after surgery.
Main outcome measures: IOP, number of post-op medication, uveoscleral outflow.
Results: Preliminary results at a mean follow-up of 11.4 months (SD 3.1, VDSCI) and 11.5 months (SD 4.2, DSCI) showed a mean post-operative IOP of 5.5 (SD 3.1, VDSCI) and 7.4 (SD 3.8, DSCI) at day one and 15.5 (SD 5.7, VDSCI) and 14.8 (SD 6.1, DSCI) at the last follow-up. The difference was not statistically significant. Two patients had perforations of the TDM. Complete Success rates were calculated using Kaplan-Meier Survival Analysis. The complication rate was comparable in both groups.
Conclusions: At 12 months of follow-up, there was no statistically significant difference between VDSCI and DSCI in terms of complete and qualified success rates. In VDSCI, UBM showed a statistically significant increase in the number of suprachoroidal effusion (uveoslceral outflow) associated with a statistically significant smaller size of the subconjunctival bleb compared to DSCI. VDSCI might be a good alternative to classical penetrating surgery.
References:
1. Krasnov MM. Externalization of Schlemm's canal (sinusotomy) in glaucoma. Br J Ophthalmol 1968; 52(2): 157-61. **2.**Zimmermann TJ, Kooner KS, Ford VJ *et al*. Effectiveness of nonpenetrating trabeculectomy in aphakic patients with glaucoma. Ophthal Surg 1984; 15: 44-9. **3.** Zimmermann TJ, Kooner KS, Ford VJ *et al*. Trabeculectomy *vs.* Nonpenetrating trabeculectomy: a retrospective study of two procedures in phakic patients with glaucoma. Ophthal Surg 1984; 15: 734-40. **4.** Kozlov VI *et al*. Nonpenetrating deep sclerectomy with collagen. Ophthal Surg 1990; 3: 44-6. **5.** Chiou AGY, Mermoud A, Hédiguer SEA *et al.* Ultrasound biomicroscopy of eyes undergoing deep sclerectomy with collagen implant using an ultrasound biomicroscope. Br J Ophthalmol 1996; 80; 541-544. **6.** Chiou AG, Mermoud A, Underdahl JP, Schnyder CC. An ultrasound biomicroscopic study of eyes after deep sclerectomy with collagen implant. Ophthalmology. 1998 Apr;105(4):746-50. **7.** Shaarawy T, Mansouri K, Schnyder C, Ravinet E, Achache F, Mermoud A. Long-term results of deep sclerectomy with collagen implant. J Cataract Refract Surg. 2004 Jun;30(6):1225-31. **8.** Kazakova D, Roters S, Schnyder CC, Achache F, Jonescu-Cuypers C, Mermoud A, Krieglstein G. Ultrasound biomicroscopy images: long-term results after deep sclerectomy with collagen implant. Graefes Arch Clin Exp Ophthalmol. 2002 Nov;240(11):918-23. Epub 2002 Oct 08. **9.** Pavlin CJ, Sherar MD, Foster FS. Subsurface ultrasound microscopic imaging of the intact eye. Ophthalmology. 1990 Feb;97(2):244-50. **10.** O'Brart DP, Rowlands E, Islam N, Noury AM. A randomised, prospective study comparing trabeculectomy augmented with antimetabolites with a viscocanalostomy technique for the management of open angle glaucoma uncontrolled by medical therapy. Br J Ophthalmol. 2002 Jul;86(7):748-54.

P301 BIOCOMPATIBILITY OF AN X-SHAPED ZIRCONIUM IMPLANT IN DEEP SCLERECTOMY IN RABBITS

S. Roy, A. Basso, A. Mermoud
Ophthalmic Eye Hospital Jules Gonin, Lausanne, Switzerland

Objective: To study biocompatibility of ceramic implants in glaucoma surgery.
Design: Experimental study based on animal models of glaucoma surgery.
Controls: Surgery was performed on eight rabbits; one eye underwent deep sclerectomy only, the other the deep sclerectomy plus insertion of a zirconium implant.
Methods: Before surgery, ultrasoundbiomicroscopy (UBM) imaging was performed, intraocular pressure (IOP) and outflow facility were measured. One eye randomly received a cross-shaped zirconium implant, the other one underwent surgery without implant. Four groups of two rabbits each went through a follow up of 1, 2, 4 and 6 months. IOP was measured three times a week for the first two weeks, then once a week thereafter. UBM and outflow facility measurements were performed at the end of the follow up period.
Main outcome measures: Pre and postoperative intraocular pressure, outflow facility, UBM imaging. Histological sections.
Results: Preoperatively mean IOP was 12.45 ± 0.89 mmHg and mean outflow facility was 0.38 ± 0.04 µl/minmmHg. At 1, 2, 4 and 6 months after surgery, IOP was 10.56 ± 1.49 mmHg, 9.99 ± 1.54 mmHg, 9.39 ± 2.26 mmHg and 11.44 ± 1.89 mmHg, respectively. Outflow facility after surgery was 0.61 ± 0.18 µl/minmmHg, 0.34 ± 0.12 µl/minmmHg, 0.52 ± 0.08 µl/minmmHg and 0.38 ± 0.02 µl/minmmHg for the deep sclerectomy only, and 0.42 ± 0.08 µl/minmmHg, 0.32 ± 0.12 µl/minmmHg, 0.35 ± 0.03 µl/minmmHg and 0.33 ± 0.08 µl/minmmHg for the implant, respectively. On UBM, the formation of a filtering space was visible in the sclera for the implant group and under the conjunctiva for the control. Histology showed that on the surgical area, new vessels growth for the sclerectomy and implant groups was 3.5 and 5.3 times higher than on the non-operated area, respectively. Difference between both groups was 53%. Spindle-shaped cells and fibrosis were observed in the tissues surrounding the zirconium implant.
Conclusions: Deep sclerectomy itself increases outflow facility and decreases IOP. The initial pressure drop observed shortly after surgery was followed by a progressive increase to a new steady state lower than the preoperative value. Using a drainage device such as a zirconium implant promotes the initial effect of the surgery. After several months, foreign body reactions and fibrosis might occur that restrain the initial benefit of such procedure, despite good initial biocompatibility.
References:
1. Piconi C, Maccauro G: Zirconia as a ceramic biomaterial. Biomaterials 1999 20:1-25. Fyodorov SN, Koslov VI *et al*. Nonpenetrating deep sclerectomy in open angle glaucoma. Ophthal Surg 1990;3:52-55. **2.** Vaudaux J, Uffer S, Mermoud A. Aqueous dynamics after deep sclerectomy: *in vitro* study. Ophthalmic Practice 1999;16:204-209. **3.** Delarive T., Rossier A., Rossier S., Ravinet E., Shaarawy T., Mermoud A. Aqueous dynamic and histological findings after deep sclerectomy with collagen implant in an animal model. Brit J Ophthalmol 2003 Nov; 87(11):1340-4. **4.** Sickenberg M, Chiou AGY, Mermoud A. Deep sclerectomy with collagen implant: A new non-perforating filtering surgery. Ophthalmology 1995;102:S134.

P302 NONPERFORANT DRAINAGE GLAUCOMA SURGERY: THE FIRST STAGE IN AQUEOUS PATHWAY

C.D. Bordeianu
Emergency Hospital Prahova 1-3, Ploiesti, Romania

Purpose: To elucidate the main drainage pathway from the AC to the intrascleral lake in nonperforant drainage glaucoma procedures, answering to the question: are the trabeculo-schlemmal manoeuvers essential for success?
Material and methods: In 30 highly decompensated trabecular glaucoma cases, with all drainage pathways blocked, I practiced this particular sequence: Schlemm's canal (SC) opening, external trabeculectomy, viscodilatation and Descemetic window opening. The percolation appeared from the first maneuver in 17 cases, was enhanced by the second maneuver in five cases and by the last maneuver in all; it was produced only by the last maneuver in 13 cases. The triangular flap closure used three separate sutures at flap apex and Meduri's releasable suture at flap base. The main manouever would be the first one to produce abundant percolation, ensuring a long lasting compensation. For this study I selected the 13 cases in which the first three maneuvers remained dry but showed a good filtration after a normal or a forced Descemetic window opening.

Results: The IOP without medication rose from 9-15 mmHg in the first day to 13-18 mmHg – afterwards. 15-20 months later the IOP was 15 – 18 mmHg without medication in all cases but one that, after medication and YAG laser failure, had to be trabeculectomized.
Conclusions: 1. The trabeculo-schlemmal manoeuvers (SC opening, external trabeculectomy and viscodilatation) seem to have little importance in the process of pressure compensation. 2. The essential maneuver in any nonperforant drainage glaucoma procedure is Descemetic window opening.

P303 NONPERFORANT DRAINAGE GLAUCOMA SURGERY: THE SECOND STAGE IN AQUEOUS PATHWAY AND SOME PRACTICAL CONSEQUENCES
C.D. Bordeianu
Emergency Hospital Prahova 1-3, Ploiesti, Romania

Purpose: To elucidate the main aqueous pathway from the intrascleral lake outwards, answering to the question: which drainage is more important - the internal or the external one?
Material and methods: The study is based upon the 30 cases of which the previous poster speaks. The question-purpose had to be answered by filtering bleb evolution in connection with the degree of compensation.
Results: The IOP without medication rose from 6-15 mmHg in the first day to 12-18 mmHg – a month later. The filtration bleb was unobservable during the first 2-4 weeks though Meduri's suture was extracted in the 4th -6th day. After 2-4 weeks, a flat filtration bleb appeared in all cases. Nine to fourteen months later, in 26 cases the IOP without medication was 15 – 20 mmHg with a flat filtration bleb. Three cases responded to medication, and one had to be trabeculectomized. After 35-40 months, the complete success decreased to 5 cases and the relative one (with medication) – to 4. 21 cases have suffered trabeculectomy.
Conclusions: 1. During the immediate postoperative period the internal drainage through Schlemm's canal ends (enlarged or not) absorbs the greatest part of the aqueous. 2. At the end of healing process, the main pathway for intrascleral lake drainage remains the wound with its thin flap (external drainage). 3. The poorer levels of induced hypotonia during the success life time and the reduced half life time of the success (under 2.5 years), much under the ones achieved by trabeculectomy, a procedure that enhances mainly the external drainage, suggest for the moment that the internal drainage is against Nature. 4. Until further efforts will succeed to achieve longer internal drainage duration, all efforts should be directed towards the internal drainage closure.

P304 FOUR-YEAR OUTCOME OF NON-PENETRATING TRABECULAR SURGERY COMPARED WITH MODIFIED TRABECULECTOMY
N.L. Wang[1], Y.B. Liang[1], Z.H. Wu[2], T.C. Ye[2]
[1]Beijing Tongren Eye Center, Beijing, China, [2]Zhongshan Ophthalmic Center, Guangzhou, China

Purpose: To compare the long-term outcome of non-penetrating trabecular surgery (NPTs) with modified trabeculectomy (Trab) in patients with POAG.
Design: Historical cohort study.
Participants: We recruited consecutive patients with POAG who lived in Guangdong province and received either NPTs or Trab from 2000.1.1 to 2000.12.30 in Zhongshan Ophthalmic center. Ninety four patients were eligible for this study. Fifty six patients (84 eyes) received NPTs (deep sclerectomy, ab externo trabeculetomgy, implants of collage or hyaluronic acid (SK gel.) and MMC). Twenty six patients (42 eyes) underwent trabeculectomy combined with releasable suture and MMC.
Methods: VA, IOP, slit lamp, UBM were performed in all subjects. Detailed medical information about their past series visits; adverse events and medication therapy were recorded. Kaplan-Meier survival was used to analyze long-term success rate.
Main outcome measures: IOP, success rate, quality success rate, mean survival time .
Results: 87.2 percent of eligible patients (82/94) complied to come back. Mean IOP at the last visit was 16.74 ± 6.74mmHg in NPTS group, and 12.17 ± 4.80 in Trab group. The difference was statistically significant (p<0.05). The complete success rate in NPTS cohort was 48.15%, quality success rate 75.31%, and mean survival time 34 months (95%CI 28, 39), while in Trab cohort, they were 76.19%, 100%, and 49 months (95%CI 44,54), respectively. Success rate between two cohorts was significantly different (p=0.004). In NPTs group, 0.98 ± 0.96 medications were used at their last visits; and 0.25 ± 0.44 medications in Trab group. However, in Trab cohort, bleb leakage occured in two eyes, and bleb-related infection was found in one eye, cataract formation observed in one eye. In NPTS cohort, implants exposure was found in two eyes.
Conclusions: Long-term outcome of IOP control with NPTs was inferior to that with modified trabeculectomy, though NPTs has less complications in long term, such as bleb leakage or infecton, and cataract formation.
References:
1. Shaarawy T, Mansouri K, Schnyder C, *et al.* Long-term results of deep sclerectomy with collagen implant. J Cataract Refract Surg. 2004 Jun;30(6):1225-31. **2.** Shaarawy T, Nguyen C, Schnyder C, *et al*. Comparative study between deep sclerectomy with and without collagen implant:long term follow up.Br J Ophthalmol. 2004 Jan; 88(1):95-8. **3.** Shaarawy T, Nguyen C, Schnyder C, *et al.* Five year results of viscocanalostomy. Br J Ophthalmol. 2003 Apr;87(4):441-5. **4.** Demailly P, Lavat P, Kretz G, Jeanteur-Lunel MN. Non-penetrating deep sclerectomy (NPDS) with or without collagen device (CD) in primary open-angle glaucoma: middle-term retrospective study.Int Ophthalmol. 1996-97; 20(1-3):131-40. **5.** Mermoud A, Schnyder CC, Sickenberg M, *et al.* Comparison of deep sclerectomy with collagen implant and trabeculectomy in open-angle glaucoma.J Cataract Refract Surg. 1999 Mar; 25(3):323-31. **6.** Spinelli D, Curatola MR, Faroni E, *et al.* Comparison between deep sclerectomy with reticulated hyaluronic acid implant and trabeculectomy in glaucoma surgery. Acta Ophthalmol Scand Suppl. 2000;(232):60-2

P305 COMPARISON OF VISCOCANALOSTOMY AND TRABECULECTOMY WITH MITOMYCINE-C AS PRIMARY PROCEDURE IN OPEN ANGLE GLAUCOMA
A. Nameh
Almoassat University Hospital, Damascus, Syria

Purpose: To compare the efficacy and complications of viscocanalostomy *versus* trabeculectomy.
Design: Randomized clinical trial .
Participants: Fifty eyes of forty patients with medically uncontrolled open angle glaucoma were randomized for tow groups: twenty-five eyes underwent viscocanalostomy and 25 eyes underwent trabeculectomy .
Methods: Viscocanalostomy was performed according to Stegman's technique. Trabeculectomy was performed according to modified Kairns technique with intraoperative MMC. IOPs were measured before surgery and 1day, 1week,1, 3, 6, 12, 18, 24 months postoperatively. Intra- and postoperative complications were recorded.
Results: The mean preoperative IOP was 29.96 ± 6.07 for viscocanalostomy group and 31.16 ± 6.03 for trabeculectomy group . The preoperative IOP-difference was statistically insignificant. The mean postoperative IOP was 22.16 ± 4.66 for viscocanalostomy group and 18.84±4.29 for trabeculectomy group. The postoperative IOP-difference was statistically significant. The number of complications was lower in the viscocanalostomy group.
Conclusion: In eyes with open angle glaucoma, the risk profile appears to be more favorable with viscocanalostomy. However, viscocanalostomy is less effective in reducing IOP than trabeculectomy.
References:
1. Alio, new non-penetrating glaucoma surgery, EUROTIMES, vol.6, issue.8, Dec2001. **2.** Dahan *et al*, non-penetrating filtration surgery for glaucoma, Journal of cataract and refractive surgery, vol.26,May2000. **3.** Garassa, Controversies in surgical glaucoma management, Eye World t, April 2000. **4.** Instituto Barraquer Barcelona, Glaucoma Microsurgery, on CD-ROM 1999. **5.** O'Brart *et al*, Viscocanalostomy *vs.* Trabeculectomy, British Journal of Ophthalmology, 2002, 86. **6.** Stegmann, Viscocanalostomy, EUROTIMES supplement, vol.4, issue.8, Dec1999. **7.** Boyd, Highlights of Ophthalmology, World Atlas Series of Ophthalmic Surgery, 1993 edition. **8.** Duane: Clinical Ophthalmology, 2002 Edition /chapter 15 /Glaucoma Surgery/.

P306 NON-PENETRATING TRABECULAR SURGERY WITH T-FLUX IMPLANT IN PRIMARY OPEN-ANGLE GLAUCOMA
G Guo, X.H Jin, X.H Sun, F.R. Meng, S.H. Qian
Eye & ENT hospital of Fudan university, Shanghai, China

Objective: To evaluate the efficacy and safety of non-penetrating trabecular surgery (NPTS) with T-Flux implant in primary open-angle glaucoma (POAG).
Design: Non- randomized clinical trial.
Participants: Thirty-nine patients (53 eyes) with POAG between April 2002 and September 2003 were analyzed.
Method: All patients were treated by NPTS with T-Flux implant and followed up for at least 12 months.
Main outcome measures: The main parameters being measured included intraocular pressure (IOP), visual acuity before and after surgery. The peri-operative and postoperative complications, and filtering bleb were observed. The relationship between successful rate and micro-perforation of the trabeculo-Descemet's membrane was evaluated as well.
Results: All patients were followed up for at least 12 months, and the mean follow-up time was 19.6±4.8months. The IOP decreased from a mean preoperative value of 31.3 ± 8.7mmHg to 16.9 ± 5.0mmHg at one year, 17.0 ± 4.8mmHg at one and a half year, and 18.0 ± 6.2mmHg at two years (P<0.0001). There is no significant difference between pre- and post-operational visual acuity(P>0.05). The rate of success (IOP≤21mmHg with or without medication) was 86.9% at 1 year, 84.8% at one and a half year, and 72.2% at two years, respectively. The success rate was significantly related to formation and retention of the reflective filtering bleb, but not related to micro-perforation of the trabeculo-Descemet's membrane. The peri-operative complications were micro-perforation of the trabeculo-Descemet's membrane, and hyphema. The early stage post-operational complications were ocular hypotony, flat anterior chamber, and choroidal detachment.
Conclusions: NPTS with T-Flux implant is a very safe operation which can provide reasonable control of IOP in POAG.
References:
1. Karlen ME,Sanchez E, Schnyder CC, *et al.* Deep sclerectomy with collagen implant: medium term results. Br J Ophthalmol, 1999, 83: 6-11. **2.** Ates H, Andac K, Uretmen O. Non-penetrating deep sclerectomy and collaen implant surgery in glaucoma patients with advanced field loss. Int Ophthalmol, 1999, 23: 123-128. **3.** Sanchez E, Schnyder CC, Sickenberg M, *et al.* Deep sclerectomy: results with and without collagen implant. Int Ophthalmol, 1996, 20:157-162. **4.** Dahan E, Drusedau MUH. Nonpenetrating filtration surgery for glaucoma: Control by surgery only. J Cataract Refract Surg 2000; 26: 695-701. **5.** Mermoud A, Schnyder CC, Sickenberg M, *et al.* Comparison of deep sclerectomy with collagen implant and trabeculectomy in optn-angle glaucoma. J Cataract Refract Surg, 1999, 25:323-331. **6.** Ravinet E, Bovey E, Mermoud A. T-Flux implant *versus* Healon GV in deep sclerectomy. J Glaucoma. 2004 Feb;13(1):46-50.

P307 TRABECULECTOMY *VS* DEEP SCLERECTOMY. 7-YEAR ANALYSIS OF A PROSPECTIVE RANDOMISED CLINICAL TRIAL
S.A.G. Gandolfi, L. Quaranta, N. Ungaro, C. Sangermani, M.G. Tardini, S. Bettelli
University Eye Clinic, Parma, Italy

Purpose: To compare the long-term outcomes of penetrating *vs* non penetrating surgeries.
Methods: Prospective, two-center randomized investigator-masked clinical trial. Eligibility: age > 65 yrs, open angle, IOP > 23 and < 30 mmHg, at least two medications in use, previous laser trabeculoplasty, topical beta blocker in fellow eye. Mean Defect < 20 dB (24/2 Humphrey full threshold). Seventy nine eyes (79 patients) enrolled and randomised by pseudoexfoliation and use of pilocarpine to deep sclerectomy (Group A, n = 41) or trabeculectomy (Group B, n = 38). Main efficacy outcome: % of eyes showing a IOP < 16, 18 or 21 mmHg without medications at the end of follow up. Secondary outcomes (a) changes in visual acuity (LogMAR), (b) % of enrolled eyes undergoing cataract surgery (b) changes in visual field. Length of follow up: seven years. Statistical analysis was performed on an 'intent-to-treat' basis. Power = 90%, alpha probability < 5%.
Results: Two eyes in Group A and one eye in Group B showed a complete failure (*i.e.* IOP > 20 mmHg unresponsive to needling + supplementation with subconjunctival 5-fluorouracil) within four months from surgery. Main efficacy outcome: (a) 21 mmHg cut-off, 43% Group A, 68% Group B, p < 0.05; (b) 18 mmHg cut-off, 18% Group A, 51% Group B, p < 0.001; (c) 16 mmHg cut-off, 3% Group A, 45% Group B, p < 0.0001. Yag-laser goniopuncture was performed during follow up in 62% of the patients randomised to DS. If goniopuncture were considered as a regular post-operative step, the 7-year success rate(s) of DS would increase as follows: 61% (21 mmHg), 40% (18 mmHg), 23% (16 mmHg). Cataract surgery was performed in 5/41 DS *vs* 19/38 TE. Further glaucoma surgery was performed in 8 DS *vs* 2 TE.
Conclusions: (a) trabeculectomy offered a better IOP control than deep sclerectomy seven years after surgery; (b) when deep sclerectomy was converted to a penetrating procedure by means of post-operative Yag-laser goniopuncture, the success rate increased significantly (c).deep sclerectomy was associated with a lower incidence of cataract extraction.

P308 CLINICAL RESULTS WITH THE TRABECTOME™ FOR TREATMENT OF OPEN-ANGLE GLAUCOMA
D. Minckler[1], G. Baerveldt[2], M.R. Alfaro[3], B.A. Francis[4]
[1]Univ.Southern Cal., Los Angeles. CA, United States of America, [2]UC Irvine, Irvine, CA, United States of America, [3]Codet Eye Institute, Tijuana, Mexico, [4]Doheny Eye, Los Angeles, CA, United States of America

Objective: To describe clinical results from a pilot study of a novel glaucoma surgical device.
Study design: Prospective interventional case series.
Participants: Thirty-seven adult Hispanic and Caucasian patients (seventeen males and twenty females) with uncontrolled open-angle glaucoma in one or both eyes with or without previous surgery or laser were recruited from a clinical practice in Tijuana, Mexico.
Intervention: Surgery was performed with the Trabectome™ in one eye of each patient.
Main outcome measures: Goldmann applanation intraocular pressures and Snellen visual acuities were measured before and after surgery. Intraoperative and postoperative adverse events were tabulated and the number of preoperative and postoperative adjunctive medications compared before and after surgery.
Results: Preoperative pressures after one week of medication wash-out averaged 28.2 + 4.4 mmHg (n = 37). Only three patients were not using topical medications preoperatively. Follow-up ranged between three months (n = 37) and 13 months (n = 11). The mean postoperative IOP at one day = 18.4 + 10.9 mmHg (n = 37); at one week = 17.5 + 5.9 mmHg (n = 37); at six months = 17.4 + 3.5 mmHg (n = 25); and at 12 months = 16.3 + 2.0 mmHg (n = 15). Visions returned

to within two lines of preoperative levels and remained stable in all patients beyond three weeks postoperatively except one, not sutured at surgery, who had a late hyphema probably associated with corneal wound gape following accidental blunt trauma. The number of adjunctive medications decreased from 1.2 + 0.6 among preoperative patients on medications (n = 34) to 0.4 + 0.6 among all patients at six months (n = 25). Blood reflux occurred in all eyes on instrument withdrawal after angle surgery and was present at day one in 22 eyes (59%) with clearing by slit lamp exam at a mean of 6.4 + 4.1 days postoperatively.

Conclusions: The Trabectome™ appears to offer a safe and effective method of lowering IOP in open-angle glaucoma.

References:

1. Brubaker RF. Targeting outflow facility in glaucoma management. Surv Ophthalmol. 2003; Suppl 1:S17-20. **2.** Lutjen-Drecoll E. Functional morphology of the trabecular meshwork in primate eyes. 1999:18:91-119. **3.** Wormald R, Wiklins MR, Bunce C. Post-operative 5-fluorouracil for glaucoma surgery. The Cochrane Database of systematic reviews. Vol 1, 2003. **4.** WuDunn D, Cantor LB, Palanca-Capistrano AM, Hoop J, Alvi NP, Finley C, Lakhani V, Burnstein A, Knotts SL. A prospective randomized trial comparing intraoperative 5-fluorouracil *vs* mitomycin C in primary trabeculectomy. Am J Ophthalmol 2002;134:521-8. **5.** Fluorouracil Filtering Surgery Study Group. Three-year follow-up of the Fluorouracil Filtering Surgery Study. Am J Ophthalmol 1991;115:82-92. **6.** Kobayashi H, Kobayashi K, Okinami S. A comparison of the intraocular pressure-lowering effect and safety of viscocanalostomy and trabeculectomy with mitomycin C in bilateral open-angle glaucoma. Gravfes Arch Clin Exp Ophthalmol 2003;241:359-66. **7.** Shaarawy T, Wu R, Mermoud A, Flammer J, Haefliger IO. Influence of non- penetrating glaucoma surgery on aqueous outflow facility in isolated porcine eyes. Br J Ophthalmol. 2004;88:950-2. **8.** Johnson DH, Johnson M. Glaucoma surgery and aqueous outflow: how does non-penetrating glaucoma surgery work? Arch Ophthalmol 2002;120(1):67-70. **9.** Heuer DK, Lloyd MA, Abrams DA, Baerveldt G, Minckler DS, Lee MB, and Martone JF: Which is better? One or two? A randomized clinical trial of single-plate *versus* double-plate Molteno implantation for glaucomas in aphakia and pseudophakia. Ophthalmology 1992;99:1512-1519. **10.** Barkan O. Technique of goniotomy. Arch Ophthalmol 1938(19):217-21. **11.** Gramer E, Tausch M, Kraemer C. Time of diagnosis, reoperations and long-term results of goniotomy in the treatment of primary congenital glaucoma: a clinical study. International Ophthalmology 1996;20(1-3):117-23. **12.** Mendicino ME, Lynch MG, Drack A, *et al.* Long-term surgical and visual outcomes in primary congenital glaucoma: 360 degrees trabeculotomy *versus* goniotomy. Journal of American Association for Pediatric Ophthalmology & Strabismus 2000;4(4):205-10. **13.** Ritch R, Shields MB, Krupin T, (Eds.) The Glaucomas, 2nd Ed., Dickens CH and Hoskins HDJr. Ch 33, Mosby, St Louis, 1996, page 729. **14.** Hill RA, Baerveldt G, Ozler SA, Pickford M, Pfreta GA, Berns MW. Laser trabecular ablation. Laser Surg Med 1991;32:11:341-6. **15.** Epstein DL, Melamed S, Puliafito CA, Steinert RF. Neodymium-YAG laser trabeculopuncture in open-angle glaucoma. Ophthalmology 1985;92:931-7. **16.** Jacobi PC, Dietlein TS, Krieglstein GK. Technique of goniocurettage: a potential treatment for advanced chronic open-angle glaucoma. Brit J Ophthalmol 1997;81:302-7. **17.** Spencer WH, (Ed) Ophthalmic Pathology An Atlas and Text, 3rd Ed, Ch 6, Glaucoma, W. B. Saunders, Philadelphia, 1985, page 481. **18.** Rosenquist R, Epstein D, Melamed S, *et al.* Outflow resistance of enucleated human eyes at two different perfusion pressures and different extents of trabeculotomy. Curr Eye Res 1989;8(12):1233-40. **19.** Kobayashi HK, Kobayashi K, Hosino T, Awaya S. Age-related changes of microfibrils in the cornea and trabecular meshwork of the human eye. Jpn J Ophthalmol 1991;35:166-74. **20.** Segawa K. Trabecular meshwork and elastin. Nippon Ganka Gakkai Zasshi 1995;99:1291-302.

P309 PRIMARY CONGENITAL GLAUCOMA: RESULTS WITH TRABECULOTOMY, TRABECULECTOMY WITH AND WITHOUT MITOMYCINE, AND COMBINED TRABECULOTOMY AND TRABECULECTOMY PROCEDURES.

B. Satana, I. Yalvac, U. Eksioglu, I. Ersoz, S. Duman
Ankara Research Hospital, Ankara, Turkey

Introduction: Glaucoma remains a major cause of blindness in children, accounting for 2.5% to 10% of all registered blind children. Approximately 80 % of patients with primary congenital glaucoma are diagnosed by one year, 65% of affected patients are male, and the disease is bilateral. Treatment of this group of patient is primarily surgical.

Aim: To determine prognosis of overall surgical procedures and also to compare the results of each procedure, included in the study.

Methods: Between Aug 1991 and Aug 2002, 121 eyes of 78 primary congenital glaucoma patients who underwent, as a primary surgery, trabeculotomy, trabeculectomy with and without mitomycine, and combined trabeculotomy and trabeculectomy procedures was detected by retrospective chart review. Seventy-two eyes of 43 patients who had regular follow-up were included to the study. Success was defined as IOP less than 21 with or without medication. Time-Table and Kaplan-Meier multivariate analysis were performed.

Results: The average age was 56.75 ± 59.84 range (1-204)months, 24 male (55.8%), 19 female (44.25). The mean follow-up time 22.95 ± 29.07 range (1-120)months. (One month follow-up patients were in the failed group). Preoperative IOP average was 32.13 ± 9.6 range (11-56) mmHg. The overall surgery Life Table survival analysis demonstrated respectively 88.03 % and 54.23 % cumulative proportional survival between 27-36 and 54-63 months. No statistically significant difference was seen between types of surgeries by Kaplan-Meier survival analysis.

Conclusion: We define the overall surgical procedures successfully as a primary surgery in congenital glaucoma. The difference between the procedures was non significant for limited age group and type glaucoma without any associated syndrome or eye disease.

References:

1. Song J,Stinnett SS, Whitson JT, Kooner KS, Ten year surgical experience with childhood glaucoma;J Ped Oph and Strab 2003;40:11-18 **2.** Mandal Ak,Naduvilath TJ,Jayagandan A. Surgical results of combined trabeculotomy and trabeculectomy for developmental glaucoma Ophthalmology 1998;105:974-982 **3.**Beck AD, Wilson WR,Lynch MG, Lynn MJ, Noe R. Trabeculectomy with adjunctive mitomycine-C in pediatric glaucoma. Am J Ophthalmol 1998;126:648-657

P310 EFFICACY OF COMBINED TRABECULOTOMY WITH DEEP SCLERECTOMY AND SINUSOTOMY

N. Nambu, M. Kuwata, M. Koriyama, A. Ando, H. Terauchi, M. Matsumura
Kansai Medical University, Osaka, Japan

Introduction: Trabeculotomy belongs to the group of non-filtering glaucoma surgeries[1,2]. Its disadvantages include a relatively higher postoperative intraocular pressure (IOP) level, and high frequency of transient elevation of IOP, though there are generally no severe postoperative complications, such as visual disturbance, or blebitis. Recently, the efficacy of a combined trabeculotomy with sinusotomy was described and shown to be useful for the treatment of primary open angle glaucoma (POAG) to obtain a lower incidence of transient elevation of IOP (15% in combined surgery, 22% in trabeculotomy alone) and lower postoperative IOP (15.6 mmHg in combined surgery, 17.8 mmHg in trabeculotomy alone)[3]. However, the level of postoperative IOP was not the same as that following a trabeculectomy with mitomycin C[4].

Aim of study: To obtain lower IOP level than the combined trabeculotomy with sinusotomy procedure, trabeculotomy combined with deep sclerectomy and sinusotomy was performed.

Methods: Twenty-nine eyes of 22 patients with POAG, developmental glaucoma, or exfoliation glaucoma, who had not undergone previous ocular surgery, were studied retrospectively. Mean IOP before surgery was 22.7 mmHg. The follow-up period ranged from 24 to 63 months (mean 43.9). The surgery was modified the combined trabeculotomy and sinusotomy. Briefly, a 4x4 mm fornix-based scleral flap of 1/3 thickness was dissected, after which a 3.5x3.5 mm section of the deep scleral flap was dissected and the overall outer wall of Schlemm's canal removed. Following insertion of a U-shaped probe into Schlemm's canal and rotation, the deep scleral flap was excised. Thereafter, the external scleral flap was sutured with two 10-0 nylon sutures and a sinusotomy was performed[4]. Complications and intraocular pressure (IOP) results were investigated, and Kaplan-Meier success probability was determined.

Results: No severe complications were seen, except for transient IOP elevation to greater than 30 mmHg in four eyes (13.7%). Although a shallow bleb was seen in all eyes, each disappeared within three months. The mean IOP at 24, 36, and 48 months after surgery was 14.9, 14.1, and 13.8 mmHg, respectively. The success probability of achieving an IOP less than 20, 16, and 14 mmHg was calculated to be 75.9%, 41.4%, and 13.8%, respectively, at 60 months after the surgery.

Conclusion: Postoperative IOP levels following a trabeculotomy with deep sclerectomy and sinusotomy were lower with the combined trabeculotomy with sinusotomy procedure. This result suggests that the deep sclerectomy may have provided efficient filtration[5,6], though the bleb in each eye disappeared within three months after surgery.

References:

1. Wada Y: Ophthalmic surgery 25; 317, 1994, **2.** Chihara E: Ophthalmic surgery 24; 735, 1993, **3.** Mizoguchi T: Acta Ophthalmol Scand 78; 191, 2000, **4.** Aiwity A: Eye, advance online publication, 2004, **5.** D'Eliseo D: Ophthalmologica 217;208, 2003, **6.** Chiselita D: Eye 15; 197, 2001

P312 A NEW METHOD OF SURGICAL REPAIR FOR 360 DEGREE CYCLODIALYSIS

S.Y. Yuen, S.P. Hui, C.F. Woo
Tung Wah Eastern Hospital, Hong Kong, China

Introduction: Cyclodialysis may result in various vision threatening complications. Methods to repair a cyclodialysis cleft had been described and yet these methods are effective for small cyclodialysis only. Other reported methods for more extensive cyclodialysis are technically difficult and may need a long postoperative recovery time and especially difficult in case with 360 degree cyclodialysis

Aim of study: To describe a new, effective and simple technique to repair 360 degree cyclodialysis in a patient suffering 360 degree cyclodialysis with hypotony, extensive annular choroidal detachment, shallow anterior chamber, disc swelling, macular folds and cataract. The advantages and disadvantages of different reported methods of repair for cyclodialysis were compared with our method

Methods: Phacoemulsification was performed through a clear corneal wound. This is followed by the insertion of capsule tension ring into the ciliary sulcus, together with a suture pass through the eyelet of the capsule tension ring, provide a tamponade force to close the 360 degree cyclodialysis cleft and stabilizes the intra-ocular lens diaphragm (Figure 2). Postoperative course is smooth and recovery is fast.

Results: visual acuity returns to 0.3 with resolution of hypotony, macular folds, disc swelling and choroidal detachment. The intra-ocular pressure remains at mid teens, cyclodialysis cleft is closed 360 degree demonstrated with ultrasound biomicroscopy, lens iris diaphragm return to its normal anatomical position with stability

Conclusion: The method we reported is a safe, effective and technically simple surgical technique for repairing 360 degree cyclodialysis

References:

1. Maumenee AE, Stark WJ. Management of persistent hypotony after planned or inadvertent cyclydialysis. Am J ophthalmol 1971;71:320-327 **2.** Ormerold LD, Baerveldt G, Murad AS, Riekhof FT. Management of the hypotonus cyclodialysis cleft. Ophthalmology 1991;98:1384-1393 **3.** Harbin TSJ. Treatment of cyclodialysis clefts with argon laser photocoagulation. Ophthalmology 1982;89:1082-1083 **4.** Krohn J. Cryotherapy in the treatment of cyclodialysis cleft induced hypotony. Acta Ophthalmol Scand 1997;91:694-696 **5.** Metrikin DC, Allinson RW, Snyder RW. Transcleral repair of recalcitrant, inadvertent, postoperative cyclodialysis cleft. Ophthalmic Surg 1994;25:406-408 **6.** Kuchle M, Naumann GO. Direct cyclopexy for traumatic cyclodialysis with persistent hypotony:report in 29 consecutive patients. Ophthalmology 1995;102:322-33 **7.** Portney GL, Purcell TW. Surgical repair of cyclodialysis induced hypotony. Ophthalmic Surg 1974;5:30-32 **8.** Hoerauf H, Roider J, Laqua H. Treatment of traumatic cyclodialysis with vitrectomy, cryotherapy, and gas tamponade. J Cataract Refract Surg 1999;25:1299-1301 **9.** Burkhard W, Rainer R. Circular cyclopexy after extensive traumatic cyclodialysis. Ophthalmic Surg Lasers 1996;27:479-83.

P313 CATARACT EXTRACTION IN EYES WITH EXFOLIATION SYNDROME – LATE COMPLICATIONS

R.A. Andreev[1], M.I. Konareva-Kostianeva[2]
[1]University Hospital 'St.George', Plovdiv, Bulgaria, [2]Medical University, Plovdiv, Bulgaria

Purpose: To follow the late results of patients with exfoliation syndrome operated for cataract by extracapsular cataract extraction (ECCE) with implantation of intraocular lens (IOL) by two surgeons.

Design: Prospective age-matched research.

Participants and controls: Twenty three patients with exfoliation syndrome were studied at the mean age of 71.26 (+/- 5.99) years – group I, and 27 patients (35 eyes) with no exfoliation syndrome at the average age of 73.37 (+/-7.43) years – group II.

Methods: Both groups were studied over period of 18.83 (+/-11.93) months.

The condition of the posterior lens capsule, change in the pupil shape, position of IOL, visual acuity (VA) and intraocular pressure (IOP) were examined.

Results: In the late postoperative period a statistically significant difference was found between both groups in respect of the posterior capsular opacification (PCO): in group I there were 11 eyes (47.83%) with PCO, and in group II - 4 eyes (11.4%); p=0.002 (Êendal tau-b).YAG-laser capsulotomies were performed en 3 eyes in group I, and with 2 eyes in group II. Changes in the pupil shape were found with 6 eyes (26.08%) in group I, and with 4 eyes (11.4%) in group II; p=0.169 .

Visual acuity was distributed as follows: for group I VA < 0.1 – with 3 patients (13.04%); VA 0.1-0.5 – with 2 patients (8.70%) and VA > 0.5 – with 18 patients (78.26), for group II respectively: VA < 0.1 – with 1 (2.86%), VA 0.1-0.5 – with 2 (5.71%) and VA > 0.5 - with 32 (91.43%) patients; p=0.169.

The eyes studied in both groups showed IOP within the statistically accepted norms.

Conclusion: Cataract extraction in eyes with exfoliative syndrome results in significantly more frequent opacification of the posterior lens capsule, which requires Nd YAG-laser capsulotomy. There is no difference between both groups in respect of the visual acuity in the late postoperative period.

References:

1. Robert Ritch,MD.Exfoliation syndrome.Survey of ophthalmology vol 45, ¹4 'Jan-Febr 2001. **2.** Liv Drotsum MD, Erling Haaskjold, Kjell Sandvig MD. Phacoemulsification in eyes with pseudoexfoliation syndrome, JCRS 1998. **3.** Avramides et al. Cataract surgery and lens implantation in eyes with exfoliation syndrome. JCRS 1997, 23:583-587. **4.** Christopher Wirbelaner, Norbert Anders, Pham, Wollen Sak, Lagua. Intraocular pressure in nonglaucomatous eyes with pseudoexfoliation sundrome after cataract surgery. Ophthalmic surgery and Lasers Vol 29(6) 1998,Clinical Science. **5.** Hietanen J,Kivela T,Vesti E,Tarkkanen A.Exfoliation syndrome in patient scheduled for cataract surgery. Acta ophthal.Copenh.1992 Aug, 70(4):440-6.

P314 PHACOEMULSICATION FOR PRIMARY ANGLE CLOSURE GLAUCOMA AND CATARACT

Z. Mandic[1], L. Bojic[2], K. Novak Laus[1], J. Korsic[1], M. Zoric Geber[1], G. Bencic[1]
[1]University Eye Clinic, Zagreb, Croatia, [2]University Eye Clinic Split, Split, Croatia

Introduction: Chronic angle-closure glaucoma is characterized by a permanent closure of the angle as a result of peripheral anterior synechiae. Various mechanisms, such as relative pupillary block, plateau iris configuration, and phacomorphic angle closure may contribute. Persistent angle closure after peripheral iridectomy suggests a major contribution of the lens component.
Aim of the study: We report the outcome of primary phacoemulsification in patients with chronic angle closure and uncontrolled intraocular pressure.
Patients and methods: We prospectively recruited 18 consecutive patients with primary angle closure glaucoma and concurrent cataract at the Eye clinic, University hospital 'Sestre milosrdnice', Zagreb from June 2001 to April 2003. Inclusion criteria included variable degree of synechial angle closure occluding the trabeculum, confirmed by indentation gonioscopy. Exclusion criteria included uveitic angle closure, rubeotic angle closure and previous filtering surgery. Standard phacoemulsification with posterior chamber intraocular lens (Alcon MA30BA Fort Worth TX) implantation through clear corneal tunnel was performed in all patients.
Results: After a mean follow up of 10,4 months the best-corrected visual acuity was better than the preoperative in 12 eyes, unchanged in five eyes, and worse in one eye. The mean preoperative intraocular pressure was 26,4 ± 6,6 mmHg, and six months postoperatively it decreased to 17,4 ± 3,1 mmHg. The trabecular meshwork showed a widening of the chamber angle in all eyes, and /or less peripheral anterior synechias on gonioscopy. The central anterior chamber depth was increased after operative procedure (2,4 ±0,34 mm preoperatively *versus* 3,7 ±0,34 mm postoperatively). In three eyes (17%) filtering procedure had to be performed.
Conclusions: Phacoemulsification and intraocular lens implantation were safe and effective in reducing IOP and improving visual acuity. These results affirm that lens extraction may be a good option in uncontrolled angle closure glaucoma.
References:
1. KurimotoY, Park M, Sakaue H, Kondo T. Changes in the anterior chamber configuration after small-incision cataract surgery with posterior chamber intraocular lens implantation. Am J Ophtalmol 1997;124:775-80. **2.** Acton J, Salmon JF, Scholz R. Extracapsular cataract extraction with posterior chamber lens implantation in primary angle-closure glaucoma. J.Cataract Refract Surg 1997;23:930-4. **3.** Gunning FP, Greve EL. Lens extraction for uncontrolled angle-closure glaucoma: long-term follow-up. J Cataract Refract Surg 1998;24:1347-56. **4.** Roberts TV, Francis IC,Lertusumitkul S, *et al.* Primary phacoemulsification for uncontrolled angle-closure glaucoma. J.Cataract Refract Surg 2000;26:1012-6. **5.** Obstbaum SA. The lens and angle-closure glaucoma (editorial). J.Cataract Refract Surg 2000;26:941-2. **6.** Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys. Br J Ophthalmol 2002;86:238-42. **7.** Fleck BW, Wright E, Fairley EA. A randomized prospective comparison of operative peripheral iridectomy and Nd:YAG laser iridectomy treatment of acute angle closure glaucoma: 3 Year visual acuity and intraocular pressure control outcome. Br J Opthalmol 1997;81:884-8. **8.** Aung T, Tow SL, Yap EY, *et al.* Trabeculectomy for acute primary angle closure. Ophthalmology 2000;107:1298-302. **9.** Tanihara H, Negi A, Akimoto M, Nagata M. Long-term results of non-filtering surgery for the treatment of primary angle-closure glaucoma. Graefes Arch Clin Exp Ophthalmol 1995; 233:563-7.

P315 EFFECT OF PHACOEMULSIFICATION ON INTRAOCULAR PRESSURE CONTROL IN PRIOR TRABECULECTOMIZED EYES
C. Cha, J.H. Chang
Yeungnam University Medical Center, Daegu, South-Korea

Purpose: To assess the effect of phacoemulsification on intraocular pressure (IOP) control in eyes with a glaucoma filtering bleb and to identify risk factors for IOP control failure.
Design: Retrospective, noncomparative, interventional case series.
Participants: Sixty-five eyes of 57 consecutive patients who underwent phacoemulsification with intraocular lens implantation in an eye with a filtering bleb at least 6 months after trabeculectomy.
Methods: Preoperative, intraoperative and postoperative factors were evaluated for association with IOP control failure requiring additional medication or further glaucoma surgical procedure, using Kaplan-Meier survival plot and Cox proportional hazards regression analysis.
Main outcome measures: IOP, number of glaucoma medications and morphologic grade of filtering bleb before phacoemulsification and at various postoperative follow-up intervals.
Results: After mean postoperative follow-up of 31.3 months, mean IOP increased from 12.1 ± 4.3 mmHg preoperatively to 14.7 ± 8.8, 13.6 ± 8.3 mmHg at 1, 12 month postoperatively (p>0.05). Repeat glaucoma surgery to control IOP occurred in two eyes (3.1%). Cumulative survival rates for IOP control were 96.9%, 71.1%, 68.8% at 1, 12, 24 month postoperatively. Risk factors for IOP control failure included an eye with preoperative IOP of 15 mmHg or more (p=0.00), presence of preoperative glaucoma medication (p=0.002) and intra-operative anterior vitrectomy due to posterior capsule rupture (p=0.006).
Conclusions: Phacoemulsification in previous filtered eyes may be safe surgical procedure for maintaining
IOP control, especially if preoperative IOP is well-controlled and posterior capsule rupture is prevented during the operation.
References:
1. Swamynathan K, Capistrano AP, Cantor LB, WuDunn D. Effect of temporal corneal phacoemulsification on intraocular pressure in eyes with prior trabeculectomy with an antimetabolite. Ophthalomology 2004;111(4):674-8. **2.** Derbolav A, Vass C, Menapace R, Schmetterer K, Wedrich A. Long-term effect of phacoemulsification on intraocular pressure after trabeculectomy. J Cataract Refract Surg 2002;28(3):425-30. **3.** Casson RJ, Riddell CE, Rahman R, Byles D, Salmon JF. Long-term effect of cataract surgery on intraocular pressure after trabeculectomy: extracapsular extraction *versus* phacoemulsification. J Cataract Refract Surg 2002;28(12):2159-64. **4.** Chen PP, Weaver YK, Budenz DL, Feuer WJ, Parrish RK 2nd. Trabeculectomy function after cataract extraction. Ophthalmology 1998;105(10):1928-35. **5.** Park HJ, Kwon YH, Weitzman M. Caprioli J. Temporal corneal phacoemulsification in patients with filtered glaucoma. Arch Ophthalmol 1997;115(11):1375-80.

P316 SAFETY OF COMBINED TRABECULECTOMY AND PHACOEMULSIFICATION IN ADVANCED POAG (A THREE YEARS FOLLOW-UP)
M.A. Ali
Magrabi Eye Hospital, Mekkah, Saudi Arabia

Purpose: To evaluate the safety, intraocular pressure reduction and visual acuity outcome as well as late postoperative complications of combined trabeculectomy and phacoemulsification in advanced POAG glaucoma patients. Early results were presented in the EGS meeting (Florence, Italy) last year.
Subjects and methods: The files of thirty patients who completed three years follow up out of the 48 eight patients who were selected for the study. The criteria of entry were: patients with advanced POAG having advanced cupping and visual field defects. The mean defects of the fields were however affected by cataractous changes as patients had varying degrees of visually significant cataracts. Best corrected visual acuity ranged between 20/100 and light perception. The mean preoperative IOP was 28.9 ±8.3 mmhg using 1-3 antiglaucoma medications. Temporal clear cornea phacoemulsification combined with superior subscleral trabeculectomy using mitomycin-c was performed for all patients. The target pressure was individualized for each patient according to the condition of his optic nerve.
Results: The early results and early postoperative complications were presented during the EGS meeting (2004). Three years of follow-up showed that the mean IOP dropped to 15.4 ± 4.2 mmhg, visual acuity improved in 21 patients between 20/30 and 20/40 on the Snellen chart, remained stationary in 6 patients and deteriorated in 3 cases. Three patients had encysted blebs and needed needling on the slit lamp to reform their blebs. Six patients needed one drug to decrease their pressures further to the target pressure (all six were using more than one drug preoperative). Only three patients needed retrabeculectomy. No late postoperative infection was recorded. Surgery was beneficial in 27 patients.
Conclusion: Separate incision phacoemulsification combined with trabeculectomy using mitomycin-c proves to be a safe procedure in managing advanced POAG patients with largely damaged optic nerves.

P317 VISUAL EXPERIENCE DURING PHACOEMULSIFICATION-TRABECULECTOMY UNDER PERIBULBAR ANESTHESIA
R. Venkatesh[1], P. Parthasarathy Sathyan[1], A.E. Kah-Guan[2]
[1]Aravind Eye Hospital, Pondicherry, India, [2]Tan Tock Seng Hospital, Singapore, Singapore

Purpose: To investigate the subjective visual experience of patients during phacoemulsification-trabeculotomy (phaco-trab) under peribulbar anesthesia.
Design: Prospective, postoperative questionnaire survey.
Methods: Sixty consecutive patients aged 30–80 years scheduled for first time phaco-trab surgery were interviewed using a standardized questionnaire about their intra-operative visual experiences and their reaction to the visual experience between 30 minutes and four hours after the surgery.
Results: Forty-four patients (73.33%) reported perception of light. One or more colors were reportedly seen by 29 patients (48.33%) patients. A large proportion of the 39 patients (65%) also reported seeing movements. Flashes, change in light brightness and instances of no light was reported by 32 (53.33%), 23 (38.33%), and 29 (48.33%) patients respectively. Except one patient, none of the patients found these visual experiences frightening and majority of them (98.33%) reported that the experience was pleasant. On bivariate analysis, followed by multiple step-wise regressions only gender was found to be a statistically significant predictor of patients who saw flashes (Odds Ratio: 3.67, 95% CI 1.175 to 11.442).
Conclusions: Phaco-trab patients operated under peribulbar anaesthesia reported lesser sensation of lights and more sensation of movements than cataract surgery patients 1. However, phaco-trab patients are less frightened of the visual experience than cataract patients 2. More research comparing phaco-trab and cataract surgery on visual experience is warranted.
References:
1. Murdoch IE, Sze P. Visual experience during cataract surgery. Eye 1994;8:666-7. **2.** Rengaraj V, Radhakrishnan M, Au Eong KG, *et al.* Visual experience during phacoemulsification under topical *versus* retrobulbar anesthesia: results of a prospective, randomized, controlled, trial. Am J Ophthalmol 2004;138:641-8.

P318 COMPARISON OF SINGLE SITE *VERSUS* TWO SITE PHACOTRABECULECTOMY
U. Yadava
Maulana Azad Medical College and Allied-, New Delhi, India

Introduction: Combining trabeculectomy with cataract surgery is aimed at minimizing the chances of post-operative rise of intraocular pressure (IOP) in susceptible individuals. However the technique of combining trabeculectomy with phacoemulsification varies with each surgeon. A good number of surgeons still prefer to do an extra capsular cataract extraction with trabeculectomy to avoid the uncertainty of results of phacotrabeculectomy. Controversy prevails over different techniques and results of phacotrabeculectomy and hence the need to establish a standard and reliable method.
Aim of the study: To compare the results of temporal clear corneal phacoemulsification with superior trabelectomy (two site) *versus* single site scleral tunnel phacoemulsification with tabeculectomy.
Methods: Sixteen patients of cataract and primary open angle glaucoma with IOP ranging from 22 to 28mmHg(with no previous glaucoma medication) posted for combined surgery were allocated to Group 1 *i.e.* single site scleral tunnel phacotrabeculectomy, and Group 2 *i.e.* temporal clear corneal phacoemulsification with superior tabeculectomy, on alternate basis. Surgical details will be outlined. IOP measurements were repeated till the end of four weeks to assess the control.
Results: Mean IOP recorded was 26mmHg pre-operatively in Group 1, while the post-operative IOP was 17.12mmHg. In Group 2, mean pre-operative IOP calculated was 28.75mmHg and 14.62mmHg post-operatively. The control of IOP was significantly better in Group 2 as compared to Group 1 (p value=0.886).
Conclusion: Drop in IOP with two site phacoemulsification plus trabeculectomy appears to be significantly more as compared to single site phacotrabeculectomy though the sample size was small it does establish the universal benefit obtained in both the groups and would need to be verified by a larger series of cases
References:
1. el Sayyad F, Helal M, et-Maghraby A, Khalil M, el-Hamzawey H. One site *versus* two site phacotrabeculectomy: a randomized study. J cataract refract Surg.1999 Jan; 25(1): 77-82. **2.** Fernandez Escamez CS. Phacotrabeculectomy: one site *versus* two site approach. Arch Soc Esp Oftalmol. 2003 Jul; 78(7): 349. **3.** Cagini C, Murdolo P, Gallai R. Longterm results of one site phacotrabeculectomy. Acta Ophthalmol. 2003 Jun; 81(3): 233-236. **4.** Rosetti L, Bucci L, Miglior S, Orzalesi N. Temporal corneal phacoemulsification combined with separate incision superior trabeculectomy *vs.* standard phacotrabeculectomy. A comparative study. Acta Ophthalmol Scand Suppl.1997;(224):39. **5.** Isasi-Saseta MB, Urcelay-Segura JL, Zamora- Barrios J, Ortega- Usobiaga J, Moreno Garcia-Rubio B, Cortes-Valdes C. Trabeculectomy and phacoemusification. One site *versus* two site approach. A comparative study. Arch Soc Esp Oftalmol. 2002 Dec; 77(2):677-80.

P319 COMBINED CATARACT AND GLAUCOMA SURGERY: PHACOTRABECULOTOMY *VS.* PHACOTRABECULECTOMY
C. Hirn, C. Vass, M. Georgopoulos, S. Sacu, G. Rainer, S. Maca
Medical University of Vienna, Vienna, Austria

Introduction: Coincidence of cataract and glaucoma makes combined cataract and glaucoma surgery an interesting alternative to cataract surgery despite increased risk of postoperative complications.
Aim of the study: Aim of the study is to compare rates of success and postoperative complications of phacotrabeculotomy and phacotrabeculectomy.
Design: Retrospective analysis of two consecutive case series of phacotrabeculotomy and phacotrabeculectomy in patients with primary open angle glaucoma (POAG) or pseudoexfoliation glaucoma (PEXG).
Methods: We included 107 patients with POAG or PEXG. In group 1, trabeculotomy was performed in 69 eyes of 58 patients after cataract surgery. In group 2, 2.5 µg or 5 µg Mitomycin C (MMC) were injected subconjunctivally about eight minutes before phacotrabeculectomy was performed in 60 eyes of 49 patients. Patients were followed for 2-3 years postoperatively. Main outcome measures were IOP and antiglaucomatous medication, Kaplan-Meier analysis of success rates for success criteria <21 mmHg and <18 mmHg and complication rates.
Results: Mean IOP in groups 1 and 2 was 14.3 to 15.4 mmHg and 12.4 to 13.7 mmHg. Differences in mean IOP were statistically significant after one and two weeks and three months ($p < 0.05$). Mean medication did not differ statistically significant between groups after the first month. Kaplan-Meier analysis yielded similar success rates for the criterion IOP <21 mmHg

with or without medication. For the criterion IOP< 18 mmHg without medication, rates of success were 63 % in group 1 and 83 % in group 2 after 1 year (p=0.0159). In group 1, hyphema occurred statistically significantly more frequently (26% *vs.* 7%; p= 0,005), whereas group 2 had a statistically significantly higher frequency of postoperative hypotony (9% *vs.* 35%; p<0.001). In group 1 significantly less patients needed secondary interventions compared to group 2 (1 *vs.* 4 eyes, p=0.01).
Conclusions: Phacotrabeculectomy with MMC resulted in slightly lower mean IOP values and statistically significantly better rates of success for IOP < 18 mmHg without therapy but more potentially sight-threatening complications and secondary interventions. Regarding IOP values <21 mmHg there was no significant difference between groups. For the majority of patients with cataract and glaucoma, phacotrabeculotomy seems to be the better option, as it provides a sufficient reduction of IOP with hardly any relevant complications.
References:
1. Friedman DS, *et al.* Surgical strategies for coexisting glaucoma and cataract: an evidence-based update. Ophthalmology. 2002 Oct;109(10):1902-1913. Review. **2.** Tanito M, *et al.* Surgical outcome of combined trabeculotomy and cataract surgery. J Glaucoma. 2001 Aug;10(4): 302-308. **3.** Gimbel HV, *et al.* Intraocular pressure response to combined phacoemulsification and trabeculotomy ab externo *versus* phacoemulsification alone in primary open-angle glaucoma. J Cataract Refract Surg. 1995 Nov;21(6):653-660. **4.** Hoffmann E, *et al.* Long-term results of cataract surgery combined with trabeculotomy. Graefes Arch Clin Exp Ophthalmol. 2002 Jan;240(1):2-6. **5.** Jampel HD, *et al.* Effect of technique on intraocular pressure after combined cataract and glaucoma surgery: An evidence-based review. Ophthalmology. 2002 Dec;109(12): 2215-24

P320 NON PENETRATING DEEP SCLERECTOMY WITH MITOMICYN C AND SK-GEL COMBINED WITH PHACOEMULSIFICATION
M. Castany, J.C.M. Catala, A. Carceller, V.C. Cuadrado
Institut Catala de Retina- Sagrat Cor, Barcelona, Spain

Introduction: In elderly population association of glaucoma and cataract is frequent. Trabeculectomy alone achieves better intraocular pressure (IOP) results than phaco-trabeculectomy although the use of mitomicyn C improves the efficacy in IOP control of the combined technique. On the other hand combined non penetrating deep sclerectomy with phacoemulsification does not seem to reduce IOP control efficacy compared with deep sclerectomy alone. Otherwise, non penetrating deep sclerectomy associates less postoperative complications such as hypotony, an important risk factor for postoperative visual loss in severe damage optic nerve.
Purpose: To evaluate the safety and short-term efficacy of Non-penetrating deep sclerectomy with Mitomicyn C and SK-Gel implant associated to phacoemulsification (PEPNP-MMC).
Material and methods: Noncomparative retrospective study of 16 eyes (14 patients) with advanced or moderate glaucoma who underwent combined phacoemulsification and non penetrating deep sclerectomy with 0,2mg/ml Mitomicyn C and SK-Gel implant. Intraocular pressure, visual acuity, number of glaucoma medications and visual field, when possible, were assessed before intervention and 1, 7 days, 1, 3, 6, 12 month. Mean follow-up was 6.3 month.
Results: mean intraocular pressure before surgery was 21.5 mmHg (S.D: ±3.5) and the mean of medications 2.6 (S.D ±0.63). At three and six months after surgery intraocular pressure (IOP) was 12.5 (S.D: ±3.4) and 13.3 (S.D: ±2.8) respectively. The mean reduction was 8.8 mmHg (S.D: ±3.8) at 3 month and 8 mmHg (S.D: ±3.3) at six months. The mean percentage of reduction was 40.5% (D.S: 16.3) at three months and 37% (S.D. ±11.2) at six months. In all postoperative visits the IOP reduction was statistically significant. Only one patient received medical treatment. Mean visual acuity improved two lines, and no patient experimented vision loss after surgery. Postoperative complications were one case of Dellen and one of intense inflammation. Nd;YAG was performed at one patient seven weeks after surgery.
Conclusions: Although further follow-up is needed, combined phacoemulsification and non penetrating deep sclerectomy with Mitomicyn C and SK-Gel implant seems to be safe and effective in IOP control in advanced glaucoma associated with cataract.
References:
1. Vass C, Menapace R. surgical strategies in patients with combined cataract and glaucoma. Curr Opin Ophthalmol 2004;15:61-66 **2.** D'Eliseo D, Pastena B, Longanesi L, Grisanti F, Negrini V. Comparasion of deep sclerectomy with implant and combined glaucoma surgery. ophthalmologica 2003; 217:208-211 **3.** Morel D.non penetrating deep sclerectomy with SKgel implant and/or 5-fluorouracile. Bull.Soc.belge Ophthalmol 2001;280:23-32 **4.** Neudorfer M, Sadetzki S, Anisimova S, Geyer O. nonpenetratin deep sclerectomy wiht the use of adjunctive mitomycin C. Ophthalmic surg Lasers Imaging 2004;35:6-12 **5.** Tanito F, Ohira A, Chihara E. Factors leading to reduced intraocular pressure after combined trabeculotomy and cataract surgery. Journal of glaucoma 2002;11:3-9

P321 ONE ENTRY FOR TWO: PHAKOEMULSIFICATION + NONPERFORANT EXTERNAL DRAINAGE GLAUCOMA SURGERY
C.D. Bordeianu
Emergency Hospital Prahova 1-3, Ploiesti, Romania

Purpose: During the EGS Congress, Florence 2004, the symposium on non-perforant drainage glaucoma surgery concluded that when cataract surgery must be associated, it must be done through a separate entry. The purpose of this paper is to present a technique that allows one entry for both procedures.
Material and methods: The surgical procedure starts with 'filtering Descemetic fenestration', a variant of non-perforant drainage glaucoma surgery that enhances the external drainage only, because Schlemm's Canal ostia are intentionally closed. After Descemetic window is opened, the deep flap is not excised but is sutured at its apex to protect the window from thermal aggression and from pressure variations during phakoemulsification. A corneal tunnel is dissected starting above the deep flap and a normal or a sleeveless phako is performed. After IOL implantation and viscoelastic washout, the deep flap is excised. The superficial flap closure uses a personal type of releasable suture, the 'double step continuous one'.
Patients: Twenty-one cases; normal phako and foldable IOL (nine cases) or cold phako and rollable ThinOptX IOL (12 cases).
Accidents: one case with window perforation during phakoemulsification resulted in a non intentional 'perforant Descemetic fenestration': it was excluded.
Results: Immediate postoperative corneal transparency – according to nucleus hardness; late VA – according to fundus associated pathology. One case with flat AC and one case with mild hiphaema. After 12-18 months, the pressure success was complete in 90.48%, relative (with medication) in 4.75%, so that the cumulated success appeared in 95.23%. A medium sized bleb accompanied from the beginning all compensated cases.
Conclusions: 1. Descemetic window cover by the deep flap suture during phakoemulsification ensures a good protection both from pressure variation and from heath aggression, even in case of sleeveless phako. 2. 'One entry for two' cataract-non-perforant drainage glaucoma surgery saves time, reduces ocular trauma and produces satisfactory results.

P322 LEKSELL GAMMA KNIFE SURGERY IN ADVANCED GLAUCOMA
P.V. Vyborny[1], L. Novacek[1], J. Pasta[1], P. Sebesta[1], V. Vladyka[2], R. Liscak[2]
[1]Central Military Hospital, Prague 6, Czech Republic, [2]Na Homolce Hospital, Prague 5, Czech Republic

Introduction: Primary Leksell Gamma Knife Surgery (LGKS) treatment of painful advanced glaucomas was indicated in patients where the conventional treatment was ineffective.
Aim of the study: The aim of LGKS is to decrease aqueous humor production.
Methods: LGKS was performed in 107 eyes of 103 patients. They were followed by an ophthalmologist at three-months intervals during the first year and twice yearly thereafter. Ciliary body was irradiated - target volume was covered by four isocenters and the dose of 40 (resp.30) Gy to the periphery 20 (resp.15) Gy at 50% isodose was used. Alleviation of pain, reduction of intraocular pressure (IOP) and pharmacotherapy were documented.
Results: The median follow-up was 26 months (range 3-80 months), 44 eyes (41.1%) have been evaluated for a period longer than 2.5 years. Male-female ratio - 68:35. The IOP higher than 30 mm Hg was measured in more than 95% of cases before irradiation. The IOP remained slightly elevated in 48 eyes (44.9%) who underwent LGKS and in 56 eyes (52.2%) it reached painless value. During the follow-up period, the antiglaucomatous pharmacotherapy could be tapered in 42 patients (39.3%) and remained stable in 51 patients (47.4%). Pain was present before irradiation an all patients. It disappeared in 71 eyes (66.4%) and was diminished in 31 eyes (29.0%). In five patients the pain did not respond to the therapy. Eight blind eyes were enucleated. There was no worsening of visual acuity (VA). One third of eyes were blind, another one third had VA light perception - 0.1. The remaining third with VA 0.16 - 1.0 with serious visual field changes remained stable.
Conclusion: Leksell Gamma Knife Surgery is a noninvasive procedure that can alleviate pain, reduce raised IOP and diminish extensive medical treatment. There were no signs of significant radiation-induced irritation or postiradiation degenerative changes of the anterior ocular segment after LGKS.
References:
1. Vladyka, V., Liscak, R., Simonova, G., Pilbauer, K., Hejdukova, Y., Novacek, L.: Progress in glaucoma treatment research: a nonrandomized prospective study of 102 patients with advanced refractory glaucoma trated by Leksell gamma knife irradiation. J.Neurosurg. (Suppl) 102: 214-219, 2005. **2.** Pilbauer, J., Hejdukova, Y., Nemec, P.:Treatment of advanced glaucomas using Leksell gamma knife: a pilot clinical study. J.Radiosurg.3: 155-158, 2000 **3.** Vladyka, V., Liscak, R.,Simonova, G., Pilbauer, J., Hejdukova, Y., Novacek, L.: Progress in glaucoma treatment research: Experience in 102 patients with advanced glaucoma treated by gamma knife. 12th International Meeting of the Leksell Gamma Knife Society, May 2004, Vienna, Austria **4.** Vyborny, P., Dohnalova, P.:Imaging techniques in diagnostics of glaucoma. Medica Publ. and Consult.,Prague 2004, 113p.(Czech)

14. COSTING STUDIES PHARMACOECONOMICS

P323 GLAUCOMA MEDICATIONS COMPLIANCE PATTERNS AMONG A GLAUCOMA PRACTICE – COST AND FREQUENCY ISSUES BETWEEN 2000 AND 2004
S. Sonty[1], A. Ahmad[2]
[1]University of Illinois@Chicago Eye Cente, Flossmoor, IL, United States of America, [2]Midwest Eye Center SC, Calumet City, United States of America

Introduction: Compliance with the ocular medications by the glaucoma patients has been very irregular since the start of Pilocarpine use because of the need of increased frequency of instillation. With the advent Newer medications with better frequency schedules it is expected to see improvement in compliance of ocular therapy for glaucoma. There are four common ways of poor compliance 1. Failure to take medication. 2. Excessive use of medications 3. Improper timing of medications and 4. taking medications for wrong reasons. Two common issues in Glaucoma patients 1. Missed Appointments and 2. failure to take medications correctly.
Aim of the study: To study the Patients' compliance with the Newer Medications with less frequent use and compare the data between the studies of 2000 and 2004.
Methods: A survey of 263 glaucoma patients from a Glaucoma Practice during One Month of visits in 2004 and 123 glaucoma Patients during 2000 were analysed. The medications used included Latanoprost, Travoprost, Bimatoprost, Timolol, Levobunolol, Metipranolol, Brimonidine, Betaxolol, Pilocarpine, Dipivefrin, Dorzolamide, Brinzolamide, Cosopt, Phospholine Iodide and Oral Acetazolamide and Methazolamide. the patients were asked the following questions. I. How often do you forget to use the medication? The answer choices were 1. All the time. 2. Often 3. Once in a while and 4. Never. They were also asked what they do to remind to put their eye drops ? and If a relative would remind them. The patients are classified by age, sex and race.
Results: 263 Glaucoma Patients included 93 males and 170 females 99 Caucasian White and 151 African Americans. Patients were interviewed about compliance, cost and frequency of use. The 200 study had 47 males and 76 females in 123 patients. 54 Whites and 66 African Americans 192/263 (73.1%) in 2004 and 99/123 (80.4%) in 2000 never missed their medications. 71/263 (26.9%) in 2004 and 24/123 (19.5%) in 2000 missed their medications. 33.1% African Americans and 17.1% Whites in 2004 and 24.2% African Americans and 14.8% White in 2000 missed their medications. 23:48 male females Ratio in 2004 and 12:12 male female ratio in 2000. Above 50 years of age 64/71 (90%) in 2004 and 21/24 (87.5%) in 2000. 46/71 (64.7%) in 2004 and 14/24 (58.3%) in 2000 non compliers were using Single Medication. 44/71 (61.9%) in 2004 and 4/23 (17.3%) in 2000 were using ONE Drop daily. 50/71 (70.4%) spent less than $ 50 per month in 2004 (not checked in 2000).
Conclusions: Non compliance rate increased to 26.9% in 2004 compared to 19.5% in 2004 compared to 51.2% in the Patel Study in 1995. Lower cost and Single medications group also had significant noncompliance rates indicating need for close watch on all glaucoma patients and also need for recurrent education and reinforcement.
References:
1. Ashburn FS, Goldberg I & Kass MA : Compliance with Ocular Therapy Surv Ophalmology 24:237,1980. **2.** Kass MA, Meltzer DW, Gordon M, Cooper D & Goldberg JJ : Compliance with Topical Pilocarpine Treatment Am J Ophthalmol 101:515,1986. **3.** Kass MA, Gordon M, Morley Jr RE, Meltzer DW & Goldberg JJ : Compliance with Topical Timolol Therapy Am J Ophthalmol 103: 188, 1987. **4.** Patel SC & Spaeth GL :Compliance in patients prescribed eyedrops for glaucoma Ophthal Surg 26:233,1995 **5.** Sonty S & Ahmad A : Differential Compliance with Glaucoma Medications among Glaucoma Patients (abstract) American Academy of Ophthalmology Meeting Dallas (Suppl) P 232 2000.

P324 REVIEW AND ANALYSIS OF COSTS AND QUALITY OF LIFE RELATED TO GLAUCOMA BLINDNESS IN EUROPE.
J. Thygesen[1], T.L. Christensen[2], P.B. Poulsen[2], P. Buchholz[3]
[1]Copenhagen Hosp, Rigshospitalet, Denmark, [2]Muusmann Research & Consulting, Kolding, Denmark, [3]Allergan R&D, Europe, Ettlingen, Germany

Introduction: If untreated, glaucoma will lead to visual impairment and blindness. Blind and visually impaired people often face difficult challenges with mobility, socialising and taking care of daily needs. The purpose of low-vision rehabilitation services is to help people with vision impairment to care for themselves and to live as active and normal as possible. A variety of low-vision and blindness rehabilitation services are available throughout Europe.
Aim: The objective of this cost analysis was to estimate treatment costs, rehabilitation costs, patient costs and quality of life (QOL) associated with glaucoma blindness in Europe.
Methods: Initially, a systematic literature review of the MEDLINE database and the health economic databases, DARE, NHSEED, and HTA was undertaken. The review focused on the costs and QOL of blindness. Secondly, a survey among national glaucoma organisations and/or national blindness organisations was undertaken. The survey focused on the national treatment patterns for late stage glaucoma. Finally, an analysis of costs and QOL was conducted for several European countries.

Results: The annual direct treatment cost ranged from EUR 429 to EUR 523. Rehabilitation costs were difficult to estimate due to the great variety of community services within different European countries. However, estimates of rehabilitation costs ranged from EUR 3,859 to EUR 8,448. Patient costs ranged from EUR 7,436 to EUR 10,200 including some one-off costs. No consensus regarding choice of QOL instrument was observed. Ten studies reported comparable time-trade-off QOL scores (TTO). The average QOL scores decreased with increasing vision impairment (see figure 1).
Conclusion: The review and analysis shows that visual impairment and blindness has a wide impact on the European societies in terms of treatment, rehabilitation and patient costs and patient QOL. However, no substantial information on QOL or costs of going blind from glaucoma was found. Thus, further research is required.
Selected references:
1. Brown, M. M., Brown, G. C., Sharma, S. and Busbee, B., Quality of life associated with visual loss; A time tradeoff utility analysis comparison with medical health states, American academy of ophthalmology, 2003; 110:1076-1081. **2.** Infeld, D.A. and O'Shea, J.G., Glaucoma: diagnosis and management, Postgrad Med J. 1998 Dec;74(878):709-15. **3.** Livingston PM, McCarty CA, Taylor HR. Visual impairment and socioeconomic factors. Br J Ophthalmol. 1997 Jul;81(7):574-7. **4.** RNIB (Royal National Institute for the Blind). The costs of blindness. Campaign report number 12, 2003 **5.** Rouland JF, Hågå A, Bengtsson S *et al.* What triggers change of therapy? In Jönsson B, Krieglstein G, eds., Primary open-angle glaucoma. Differences in international treatment patterns and costs. Isis Medical Media Ltd., Oxford:1999;162-168. **6.** Quigley, H.A., Number of people with glaucoma worldwide, Br J Ophthalmol, 1996 May;80 (5):389-93.

P325 COST-EFFECTIVENESS OF OCULAR PROSTAGLANDINS IN THE FIRST YEAR USING PATIENT PERSISTENCE ON THERAPY
G. Reardon[1], R.E. Sheffield[2], G.F. Schwartz[3], G. Bazalo[4]
[1]Informagenics, LLC, Worthington OH, United States of America, [2]Pfizer Inc, New York NY, United States of America, [3]Greater Baltimore Medical Ctr, Baltimore, MD, United States of America, [4]Managed Solutions, LLC, Scottsdale, AZ, United States of America

Purpose: This study evaluated cost-effectiveness (CE) among ocular prostaglandins from a U.S. health insurance plan perspective using a decision-analytic framework.
Design: Retrospective cohort study.
Participants: 3096 eligible patients.
Methods: Data inputs were derived from the Constella managed care database. Patients ≥40 years of age who initiated therapy with bimatoprost 2.5 ml (BIM_2.5) or 5 ml (BIM_5), latanoprost 2.5 ml (LAT), or travoprost 2.5 ml (TRA) between 4/01 and 12/02 were included. Eligible patients had no ocular hypotensive therapy and were continuously enrolled 180 days prior to the start date. Patients were deemed persistent until they either discontinued or changed the initial therapy and were censored upon termination of insurance coverage or reaching the study end (12/30/02). Cox regression analyses were adjusted for sex and age. First-year treatment (medical and pharmacy) costs were assigned based on whether patients were persistent, discontinued, or changed therapy. The CE ratio for each therapy was the mean first-year treatment cost divided by initial days on persistent therapy in the first year.
Main outcome measure: Persistent days on therapy from start date.
Results: In all, 3096 patients met the inclusion criteria (BIM_2.5, n=236; BIM_5, n=398; LAT, n=1791; TRA, n=671). Patient persistent days on therapy were: BIM_2.5, 105; BIM_5, 120; LAT, 130; TRA, 97. First-year treatment costs were: BIM_2.5, $797; BIM_5, $923; LAT, $731; TRA, $709. CE ratios were: BIM_2.5, $7.62; BIM_5, $7.71; LAT, $5.64; TRA, $7.28. Using the lowest-effectiveness product (TRA) as reference, incremental CE ratios were BIM_2.5, $12.29; BIM_5, $9.60; LAT, $0.70. A sensitivity analysis revealed that these findings were generally stable to changes in assumptions including number of medical visits, days supply, days before discontinuation or change, and persistence rate.
Conclusions: This is the first study to evaluate cost-effectiveness among the ocular prostaglandins using patient persistence as a therapeutic endpoint. Latanoprost had the lowest cost per persistent day of therapy of the products evaluated.
References:
1. Rouland, J.F., C. Le Pen, C. Gouveia Pinto, *et al.* Pharmacoeconomics 21, no. 3 (2003): 201-13. **2.** Gurwitz, J. H., R. J. Glynn, M. Monane, *et al.* Am J Public Health 83, no. 5 (1993): 711-16. **3.** Kobelt, G., L. Jonsson, U. Gerdtham, *et al.* Graefes Arch Clin Exp Ophthalmol 236, no. 11 (1998): 811-21. **4.** Denis, P., A. Lafuma, G. Berdeaux. J Glaucoma 13, no. 4 (2004): 283-90. **5.** Oostenbrink, J. B., M. P. Rutten-van Molken, T. S. Sluyter-Opdenoordt. J Glaucoma 10, no. 3 (2001): 184-91. **6.** Reardon, G., G. F. Schwartz and E. Mozaffari. Clin Ther 25, no. 4 (2003): 1172-85.

P326 GLAUCOMA LIPID THERAPY: A DATABASE ANALYSIS OF REFILL COSTS AND BUDGET IMPACT
J.G. Walt[1], J.T. Wilensky[2], R. Fiscella[2], T.H. Chiang[1], A. Guckian[3], T.M. Bennett[3], R. Diefenderfer[3]
[1]Allergan Global, Irvine, CA, United States of America, [2]University of Illinois at Chicago, Chicago, IL, United States of America, [3]NDCHealth, Phoenix, AZ, United States of America

Introduction: Glaucoma is the second leading cause of blindness in the US with substantial expense to healthcare systems. The finding that IOP reduction by topical medication reduces glaucoma-related blindness has led to interest in glaucoma as a cost driver and choices in pharmacotherapy as ways of managing costs.
Aim of the study: The purpose of this study was to examine mean days between patient refills of latanoprost, travoprost, or bimatoprost as a means of comparing economic impact.
Methods: Patients from between September 2002 and December 2002 were identified using a retail pharmacy database. Continuous eligibility was defined based on at least one claim being made for the same lipid agent and bottle size one year later between October 2003 and December 2003. The mean numbers of days between claims and number of refills, the average cost per patient per year, and differences between cohorts in the annual refill costs were calculated. Due to limitations inherent in claims data analyses, efficacy data were not analyzed.
Results: The mean number of days between refills was 47 for latanoprost, 53 for travoprost, and 52 for bimatoprost. The among-group difference was significant (p<0.0001). The mean numbers of refills per year were calculated to be 7.8, 6.9, and 7.0 for latanoprost, travoprost, and bimatoprost, respectively. Based on the mean number of refills, the average cost per patient per year was $429.11 for travoprost, $434.70 for bimatoprost, and $455.36 for latanoprost. The refill cost savings on an incremental basis per year for the latanoprost population (n= 79,820) would be approximately $2 million by using bimatoprost or travoprost instead of latanoprost.
Conclusions: For this population, the economic burden to the healthcare system is reduced by using bimatoprost or travoprost rather than latanoprost. Both bimatoprost and travoprost have higher average days between refills, suggesting these two products may last longer than latanoprost. Bimatoprost and travoprost patients have fewer annual refills and consequently lower annual refill cost compared to latanoprost. The results from other studies (J.G.W., unpublished data, 2005) suggest that administration technique can result in more drops administered from a bottle of bimatoprost than from those of travoprost and latanoprost, thus reducing the need for refills. This finding may explain increased patient adherence to bimatoprost over latanoprost or travoprost identified from a separate database.
References:
1. Weinreb RN. Lancet 2004;363:1711-1720. **2.** Distelhorst JS. Am Fam Phys 2003;67:1937-1944. **3.** Dalzell MD. Pharmacy Thera 2002;27(11 Suppl):10-15. **4.** Kobelt-Nguyen G. J Glaucoma 1998;7:95-104. **5.** Kass MA. Arch Ophthalmol. 2002;120:701-713.

P327 MEDICAL CARE COSTS OF PRIMARY OPEN-ANGLE GLAUCOMA IN THE UNITED STATES: A NATIONAL ESTIMATE USING THE MEDICAL EXPENDITURE PANEL SURVEY
G.F. Schwartz[1], M.A. Mychaskiw[2]
[1]Glaucoma Consultants, Baltimore, MD, United States of America, [2]Pfizer, Inc., New York, NY, United States of America

Purpose: The aim of this study was to estimate the direct costs of medical care associated with the treatment of primary open-angle glaucoma (POAG) in the United States.
Design: Retrospective analysis of the 2001 Medical Expenditure Panel Survey (MEPS) data.
Participants: The MEPS collected survey and administrative claims data from a nationally representative sample of 33,556 respondents and from respondents' health care and insurance providers.
Methods: Data extracted for this study included demographics (patients >40 years of age), medical conditions, and utilization of and payments for medical care. Patients with POAG were identified using ICD-9-CM codes and direct costs were calculated using patient and third-party payments for POAG-related medical events by type of care provided (office-based provider visits, prescription medications, and outpatient services). Sample estimates were weighted and projected to the population and 95% confidence limits were calculated using the Taylor expansion method.
Main outcome measures: Estimated prevalence and total direct costs of POAG in the United States.
Results: The estimated prevalence of POAG using the MEPS was 1.25% (95% C.L.=0.94%-1.56%) or 1,640,087 individuals. Total direct costs of POAG were $1,788,914,417, with an average cost of $1,091 per patient. Prescription medications accounted for $1,042,509,011 (mean cost / prescription=$58; 95% C.L.=$54-$63) of direct costs. Office-based provider visits represented $619,401,436 (mean cost / visit=$105; 95% C.L.=$96-$113) and outpatient services represented $127,003,970 (mean cost / patient=$316; 95% C.L.=$198-$434).
Conclusions: Using the MEPS, POAG was estimated to affect nearly 1.7 million individuals with resultant medical care costs approaching $2 billion. Although prescription medications accounted for 58% of total direct costs, they had the lowest mean cost across the types of care. It may well be that innovative drug therapies, which are preferable to less effective alternatives, contribute to less utilization of more costly medical care.
References:
1. Agency for Healthcare Research and Quality. The Medical Expenditure Panel Survey 2001. **2.** http://www.meps.ahrq.gov. **3.** Bateman DN, Clark R, Azuara-Blanco A, Bain M, Forrest J. The effects of new topical treatments on management of glaucoma in Scotland: an examination of ophthalmological health care. Br J Ophthalmol 2002;86:551-4. **4.** Fiscella RG, Green A, Patuszynski DH, Wilensky J. Medical therapy cost considerations for glaucoma. Am J Ophthalmol 2003;136:18-25. **5.** Kobelt G. Health economics, economic evaluation, and glaucoma. J Glaucoma 2002;11:531-9. **6.** Rouland JF, Le Pen C; Ophthalmologists of the Glaucoma Study. Naturalistic, prospective study of glaucoma and ocular hypertension treatment in France: strategies, clinical outcomes, and costs at 1 year. Eur J Ophthalmol 2003;13(Suppl 4):S5-20. **7.** Vold SD, Riggs WL, Jackimiec J. Cost analysis of glaucoma medications: a 3-year review. J Glaucoma 2002;11:354-8.

15. MISCELLANEOUS

P328 THE PATTERN AND SEVERITY OF PRIMARY GLAUCOMA IN QATAR
F. Al Mansouri
Hamad Medical Corporation, Doha, Qatar

Purpose: To describe the pattern and severity of both types of primary glaucoma in Qatari adult patients and to outline the main problems related to their management.
Material and methods: A random sample of 526 Qatari patients with primary glaucoma, either open angle (POAG) or angle closure glaucoma (PACG) was studied by standard questionnaire as regards their personal and medical profile, and assessed ophthalmologically both subjectively and objectively.
Results: Over 2/3 of the random sample of patients were POAG (70.8%). POAG affected patients at an early stage (before 40years) in 23.4% compared to ACG (10.7%) and in severe forms (36.4% & 45.4%) respectively. In both groups positive family history was the most significant risk factor (34.5%) with progressive glaucomatous optic neuropathy occurring in 36.7% and poor compliance in 46.5%.
Conclusions: Glaucoma in Qatari patients presents at an early age, with substantial loss of visual function at presentation. Poor compliance is an obstacle for management in both types of glaucomas. The need for an educational campaign and a program for early detection and treatment is highly recommended.

P329 AN INVESTIGATION FOR THE EVENTS THAT LED TO THE DIAGNOSIS OF GLAUCOMA IN SICHUAN, CHINA
X. Chen[1], Y. Liu[2], M. Li[2], N. Li[2]
[1]West China Hospital, Chengdu, China, [2]West China Eye Center, Chengdu, China

Purpose: To determine the triggers that referred patients to hospital, so that glaucoma was identified in Sichuan, China.
Design: Retrospective, consecutive, non-comparative case series.
Participants: 287 consecutive primary glaucoma patients who visited West China Eye Center in 2004.
Methods: A questionnaire was administered to the patients.
Main outcome measures: The questions include in which hospital the patient was diagnosed initially, the reason that led the patient to hospital, the main ocular symptoms that patient complained, and the abnormality which brought the deepest impression to the patient, etc.
Results: Decreased vision (87.7%), ocular pain (80.8%) and bulbar hyperemia (78.1%) were the most common events of acute angle-closure glaucoma patients who sought medical help. 39.7% of 136 patients with chronic angle-closure glaucoma and 46.2% of 78 patients with open angle glaucoma had decreased visions. 25% of the patients who had no ocular symptom were diagnosed during routine examinations, or during examinations as having positive family history. Seventy-one of glaucoma patients (205 of 287) recalled elevated intraocular pressure (IOP) as the most important abnormality for their initial diagnosis. 75% of the patients with chronic angle-closure glaucoma or open angle glaucoma were identified as middle or late stage of glaucoma at least one eye at the diagnostic visit.
Conclusion: In Sichuan, glaucoma was most frequently found due to patients had some glaucoma-unrelated symptoms. The main symptom that patients of this survey complained was decreased vision. The deepest impression on those patient was elevated IOP. It is urgent to pursue an earlier detecting for glaucoma patients in China.
References:
1. Quigley HA: The number of persons with glaucoma worldwide. Br J Ophthalmol 1996; 80: 389-393. **2.** Quigley HA, West SK, Rodriguez J, *et al*: The prevalance of glaucoma in a population-based study of Hispanics: proyecto Ver. Arch Ophthalmol 2001; 119: 1819-1826. **3.** Quigley HA, Jampel HD: How are glaucoma patients identified? J Glaucoma 2003; 12: 451-455. **4.** Bell, RWD, O'Brien, C: The diagnostic outcome of new glaucoma referrals. Ophthalmic and Physiological Optic 1977; 17: 1-6. **5.** Green J, Siddall H, Murdoch I: Learning to live with glaucoma:

a qualitative study of diagnosis and the impact of sight loss. Social Science & Medicine 2002; 55: 257-267

P330 A META-ANALYSIS OF RANDOMIZED CLINICAL TRIALS ON EFFICACY AND SAFETY OF BIMATOPROST

L. Rossetti, N. Orzalesi
University of Milan, Milan, Italy

Prostaglandin analogues, have played an increasingly important role in the medical management of glaucoma and ocular hypertension. The three prostaglandin analogues latanoprost, travoprost and bimatoprost have been shown to decrease IOP in POAG and OHT patients to a greater extent than beta-blockers. Though their hypotensive effect seems to be similar during daytime, a debate is still open on the drug with better IOP lowering effect and less secondary effects. Noteworthy, conflicting results have recently been reported in recent trials. We reviewed all randomized clinical trials (RCTs) on efficacy and safety of prostaglandin analogues in order to: a. perform a quantitative meta-analysis of RCTs' results; b. compare data on the three drugs and obtain a summary estimate of their effects; c. try to solve controversies among results of existing RCTs; d. assess RCTs' methodological quality. Phase III and IV RCTs comparing efficacy and side effects of prostaglandin analogues were collected (MEDLINE and EMBASE database literature search). The quality of the RCTs was evaluated by two independent evaluators. Data about drugs efficacy and side effects were collected. Calculation of 'summary odds ratio' with Mantel-Haenszel-Peto method for meta-analysis of proportions: incidence of systemic and ocular side effects. Calculation of the 'effect size' for decrease of IOP: 1. WMD (fixed); 2. mean difference (fixed). Review Manager 4.2 program was used for calculations. 114 RTCs on efficacy of prostaglandin analogues were found. Of these, seven studies were comparing bimatoprost with another prostaglandin analogue. The total sample size was 1,123 patients, mean 160 (range 31-411). Mean follow-up was 2.5 months (range 1-6). All Patients had POAG or OH and were either new or after proper w-o. 6/7 trials were comparing bimatoprost with latanoprost while 3/7 were comparing bimatoprost with travoprost. The pooled estimate from the 7 RCTs indicated that bimatoprost was more effective in reducing IOP than the other PGs, and the difference was 0.96 mmHg (95% C.I. 0.7-1.3). The heterogeneity among studies' results was not significant. Bimatoprost was associated with an increased risk of ocular side effects, with a summary OR = 2.73 (95% C.I. 2.13-3.69). When only severe side effects were considered (i.e. side effects that did not allow the patient to complete the trial) the difference among prostaglandin analogues was not significant (OR=1.48, 95%C.I. 0.62-3.29). In conclusion, bimatoprost was found to be more effective in reducing IOP, though its use was associated with an increased occurrence of ocular side effects.

P331 USING THE STARD CRITERIA TO ASSESS THE QUALITY OF DIAGNOSTIC ACCURACY STUDIES OF OCT IN GLAUCOMA

Z.K. Johnson, A. Azuara-Blanco
Aberdeen Royal Infirmary, Aberdeen, United Kingdom

Introduction: Optical Coherence Tomography (OCT) has been proposed as a useful tool for the diagnosis of glaucoma. If diagnostic studies are not conducted or reported properly, interpretation of their results in terms of clinical applicability is then difficult. The STARD (Standards for Reporting of Diagnostic Accuracy) statement was published in January 2003 following a consensus conference in 2000. It was designed to improve the quality of reporting of studies of diagnostic accuracy and consists of a check list of 25 items and a flow diagram.
Aim of the study: To assess the quality of published reports on the diagnostic accuracy of OCT for glaucoma using the STARD criteria.
Methods: This was a retrospective review of published studies reporting on the diagnostic accuracy of OCT in glaucoma. 'Medline' was searched using the terms 'glaucoma', 'OCT' and 'tomography, optical coherence', to identify potential papers. Abstracts and papers in the English literature were then reviewed to identify those that reported the diagnostic ability of OCT in glaucoma. The studies had to include both normal and glaucoma subjects and also report a measure of diagnostic accuracy (for example sensitivity and specificity, or the area under the receiver operator characteristic curve). The STARD checklist was then used to assess each paper, with each item scored as fully, partially or not fulfilled. The Main outcome measure was the number of items satisfactorily fulfilled.
Results: The initial search was performed in October 2004 and identified 41 possible papers. Out of these only 11 fulfilled the inclusion criteria. They were all published since 2001. The earliest had the lowest number of fully reported items (8), and the latest published the highest number (18). Of the 25 items, seven were reported by all the studies, and four by none of them. The reporting of the study population was variable. The majority of studies poorly reported details of who was performing the tests, whether the investigators were experienced or masked to the diagnosis, and statistical methods. The majority of studies did not report how many eligible subjects were excluded.
Conclusions: The quality of reporting of the diagnostic accuracy of OCT in glaucoma has been very variable and, overall, sub-optimal. This means that interpreting these results in terms of whether this test may be clinically useful is difficult. Further scientific study is required to clarify the role of OCT in the diagnosis of glaucoma.
References:
1. Bossuyt, PM *et al.* Towards complete and accurate reporting of studies of diagnostic accuracy: The STARD initiative. Ann Intern Med 2003; 138: 40-45. **2.** Bossuyt, PM *et al.* The STARD statement for reporting studies of diagnostic accuracy: Explanation and Elaboration. Ann Intern Med 2003; 138: W1-W12. **3.** Bossuyt PM, Reitsma JB. The STARD initiative. The Lancet 2003; 361: p71.

P332 TOPICAL MEDICAL THERAPY IN PRIMARY OPEN ANGLE GLAUCOMA AND OCULAR HYPERTENSION: A COCHRANE REVIEW.

C. Vass, C. Hirn, S. Sacu, T. Sycha, O. Findl
Medical University of Vienna, Vienna, Austria

Introduction: Only recently large multicenter trials have established the benefit of medical antiglaucomatous therapy in ocular hypertension and glaucoma. These trials however did not compare different medications. There is little evidence whether there is any difference in visual field preservation of different topical antiglaucoma drugs.
Aim of the study: This review aims to summarize the evidence for the efficacy of different forms of topical medical treatment of primary open angle glaucoma or ocular hypertension to prevent the progression or the onset of glaucomatous optic neuropathy.
Methods: Systematic review of randomized controlled trials (RCT). All RCTs comparing topical pharmacological treatment to placebo, no treatment, or other treatment for specified endpoints which included subjects with primary open angle glaucoma or ocular hypertension, and with duration of treatment of at least one year are included in the review. Two reviewers working independently assess the titles and abstracts of all reports identified by the electronic searching. The full text copies of possibly and definitely relevant trials are obtained and assessed according to the inclusion criteria. Only trials meeting these criteria are assessed for methodological quality. There are no restrictions concerning publication date or language. Data from studies collecting similar outcomes and using similar follow-up times will be summarised after testing for heterogeneity between trial results using a standard chi-square test. For dichotomous data, results will be expressed as odds ratio estimates or risk ratio estimates (95% confidence interval). Also the risk difference or the number needed to treat will be obtained (95% confidence interval). For continuous data, the mean and standard deviations will be obtained. Standard errors will be converted to standard deviations. Results will be summarised across studies using weighted mean differences (95% confidence intervals). Sensitivity analyses will be conducted with the following adjustments: 1) exclusion of trials scoring C on any aspect of trial quality, 2) exclusion of trials which have assumed that eyes within an individual are independent.
Results: The primary outcome for this review will be the reduction of onset or progression of visual field loss. The secondary outcomes for this review will include: improvement of visual field, reduction of nerve fibre layer loss progression (according to objective measurement), reduction of optic nerve head cupping progression (according to objective assessment), local and systemic side effects leading to the cessation of treatment.
Conclusion: It will be concluded whether there is any evidence in favor of the selection of any specific topical drug to preserve the visual field in glaucoma or ocular hypertension.
References:
1. Lichter PR *et al.* (2002) Arch Ophthalmol 120:1371. **2.** Kass MA *et al.* (2002) Arch Ophthalmol 120:701. **3.** Rossetti L *et al.* (1993) Online J Curr Clin Trials:1059

P333 META-ANALYSIS OF GLAUCOMA PATIENTS' QUALITY OF LIFE

G.L. Spaeth[1], J.G. Walt[2]
[1]Wills Eye Hospital, Philadelphia, PA, United States of America, [2]Allergan Global, Irvine, CA, United States of America

Introduction: Glaucoma is progressive and irreversible, and is a leading cause of blindness worldwide. However, the frequency of blindness among glaucoma patients in the US is much lower because of widely available therapeutic interventions. Primary open angle glaucoma, the most common form, has an age-adjusted prevalence of 1.55% in the US. Advanced glaucoma causes severe disability, and while glaucoma in its earliest stage is usually asymptomatic, recent National Eye Institute (NEI) trials and studies including quality of life (QoL) surveys suggest vision and daily function may be affected earlier than previously recognized. Decreased visual ability due to glaucoma obviously impacts the QoL for diagnosed patients and potentially for those not yet diagnosed. A survey conducted recently by the Glaucoma Research Foundation (GRF) found that patients place a high priority on maintaining their vision and vision-related QoL, and consequently are often willing to accept the risks of treatment.
Aims of the study: The purpose of the study is to show that understanding the impact of glaucoma on patients' ability to function and their QoL can guide therapeutic choices and strategies for improved adherence to therapeutic regimens, and may suggest alterations to patients' environments to help them cope better with the effects of the disease.
Methods: The results for glaucoma patients were analyzed from general health-related questionnaires (the Sickness Impact Profile [SIP], SF-36, and MOS-20); vision-specific QoL instruments (Activities of Daily Vision Scale [ADVS], the VF-14 Instrument, the Visual Activities Questionnaire (VAQ), the National Eye Institute Visual Function Questionnaire (NEI-VFQ), and the Impact of Vision Impairment (IVI) Instrument); and glaucoma-specific instruments (the Glaucoma Symptom Scale [GSS], the Symptom Impact Glaucoma [SIG], the Glaucoma Health Perceptions Index (GHPI), and the GQL-15 Questionnaire).
Results: The more generic the survey the less useful it was in assessing the effect of glaucoma on QoL and the ability to perform activities of daily living. Correlation between survey and clinical data was often lacking.
Conclusions: The results of this review-analysis should encourage glaucoma health care providers to seek to understand the ramifications of glaucoma from the early stages in terms of QoL. Such information should be helpful in the delivery of therapies currently available as well as those in development for the future. Patients seek glaucoma-related information and desire to obtain this information from their physicians. There appears to be a need for a better way to assess QoL and disability in patients with glaucoma.
References:
1. Quigley HA. Br J Ophthalmology. 1996;80:389-393. **2.** Eid TM. Ophthalmology. 2003;110:900-907. **3.** Quigley HA. Invest Ophthalmol Vis Sci. 1997;38:83-91. **4.** Sommer A. N Engl J Med. 1991;325:1412-1417. **5.** Altangerel U. Curr Opin Ophthalmol. 2003;14:100-105. **6.** Gallup Study of Eye Health: Survey of Glaucoma Sufferers. Princeton, NJ: Multi-Sponsor Surveys, Inc.; 2002:1-90.

P334 GLAUCOMA MANAGEMENT SYSTEM 2nd EDITION: NEW SOFTWARE FOR AN ELECTRONIC PATIENT CASE HISTORY RECORD THAT ALLOWS PATIENT MONITORING, DAMAGE APPRAISAL OF THE DEVELOPMENT OF THE GLAUCOMA DISEASE AND TARGET IOP

P.D. Paoli[1], P. Brusini[2], C.E. Traverso[3]
[1]Hospital of Monfalcone (Gorizia), Monfalcone, Italy, [2]Hospital Of Udine Italy, Udine, Italy, [3]University of Genova Italy, Genova, Italy

Introduction: The Glaucoma Management System (GMS) is an interactive database which provides the ophthalmologist not only with an electronic patient case history record, but also provides a series of suitable instruments to diagnose and map out the patient's development of the glaucoma disease.
Aim of the programme: GMSdatabase was created to function as a complete patient case history that allows fast and easy access to the patient's data. The classification of the perimetric damage and the morphologic papillary aspect can serve as a guide towards the standardization of diagnostic methods used. There is also a layout provided to record the therapy provided, allowing the recording of ineffective treatments, adverse effects encountered, the actual drug in use, its dosage and the patient's compliance to treatment.
Methods: The GMSdatabase is software created using MS(Microsoft)Access. This software allows the Ophthalmologist to call up records at a touch and also permits the receipt of information according to the EGS guidelines. The program contains a guided reference of the Visual Field with staging according to GSS (by Paolo Brusini). Thus allowing the visualization of the damage on the GSS chart. Furthermore, risk factors and staging of the Visual Field can be compared to obtain a target IOP.
Results: The advantages of a GMSdatabase patient case history are numerous, but the most useful and important are: 1) Quick way to keep under control and to access the number of visits executed 2) An excellent diagnostic tool to record the appraisal of costs and drug effectiveness and/or adverse effects. 3) Standardization of the conditions of the optic disc 4) Staging of the development of the perimetric damage 4) Possibility to compare data with other centers using the same software 5) Allows for simple or complex 'search' mode to allow comparison of homogenous groups of patients.
Conclusion: GMS is a practical instrument for speeding up and facilitating clinical practice. It promises to be a starting point for scientific research of the glaucoma and could become an initial guideline in its treatment and diagnosis in according to EGS Guidelines. Hopefully the use of this software, that allows the collection and comparison of vast amounts of patient/disease data, will provide some insight to solving some problems associated with the glaucoma disease.
References:
1. Brusini P. Clinical Use of a new Method for visual field damage classification in glaucoma Eur J Ophthalmol 1996;6:402-407 **2.** Hoddapp E, Parrish II RK, Anderson AR. Clinical decisions in glaucoma. St.Louis,The CV Mosby 52-61, 1993. **3.** Terminology and Guidelines for Glaucoma IInd Edition EGS-2003 **4.** Traverso C.E. Practical points on the target intraocular pressure. Glaucomaworld N°19 - May 2000 **5.** Zeyen T., Target Pressures in Glaucoma, Bull. Soc. Belge Ophtalmol. 274, 61-65,1999

P335 BILATERAL PERSISTENT HYPERPLASTIC PRIMARY VITREOUS WITH BUPHTHALMOS: A CASE REPORT

S. Gupta[1], S. Goyal[2], R.K. Bansal[3]
[1]G.M.C.H. Chandigarh, Chandigarh, India, [2]G.M.C.H. Chandigarh, India, Chandigarh, India, [3]G.M.C.H, Chandigarh, Chandigarh, India

Introduction: Persistent Hyperplastic Primary Vitreous (PHPV) can have wide clinical presentations. Most cases tend to be unilateral though review of various cases from the literature shows it to be present in both eyes of 11% of cases. 1. The cases that present bilaterally have associated systemic anomaly and die at a younger age. Our patient has no systemic abnormality; a similar case of bilateral PHPV without any systemic disease has been reported earlier. 2. Buphthalmos due to secondary glaucoma is an important late presentation of PHPV and has been reported in 26% of the cases. 3. One eye of our patient had buphthalmos with IOP of 19.4mmHg. Glaucoma in PHPV could result from recurrent vitreous hemorrhage, which is the most likely mechanism in our case 3.
Aim of the study: To present as poster a rare case of bilateral PHPV with buphthalmos in one eye.
Method: A five-month-old male infant was seen in out patient with history of bilateral leucocoria since the age of four months.
Results: Examination of eyes under general anesthesia showed: Right eye corneal diameter of 14mm in horizontal and 13.5mm in vertical meridian. Anterior chamber was shallow. Iris showed blood vessels going from iris to the lens surface with ectropion uvea. The lens was clear. There was no view of the fundus other than a red glow from dense vitreous hemorrhage. Intraocular pressure was 19.4mmHg with Schioz tonometer.
Left eye: Corneal diameter was 9.5 mm in horizontal and vertical meridian. Anterior chamber was normal. Lens was clear. There was a fibrovascular membrane on the posterior surface of the lens obscuring the fundus view. Intraocular pressure was 14.6mmHg. B scan ultrasonography of the right eye was suggestive of vitreous hemorrhage with a fibrous band from disc to posterior lens surface. Left eye scan showed a similar hyper echoic shadow from disc to posterior lens surface suggestive of fibrous band from disc to posterior lens surface.
MRI scan on T1 image showed hyper intense echoes from vitreous cavity of right eye and central hypo intense echoes from disc area to the posterior lens surface in both eyes . Histopathology of the right eye showed dense fibro vascular band extending from disc to posterior surface of lens confirming diagnosis of PHPV. The left eye underwent pars plana lensectomy with vitrectomy. After lensectomy ciliary processes were seen to be dragged towards the center and retina was thrown into fixed folds and was incarcerated into the fibro vascular band.
Conclusion: Bilateral PHPV is a rare disorder and sometimes can present as secondary glaucoma due to recurrent vitreous haemorrhage.
References:
1. Haddad R, Font R, Reeser F. Persistent hyperplastic primary vitreous: a clinicopathological study of 62 cases and review of literature. Surv ophthal 1978; 23:123-134. **2.** Magnus H. Doppelseitiges Pseudogliom, yorgetauscht durch Bindegewebsbildung hinter der Linse mit Arteria hyaloidea persistens bei Mikroophthalmos. Graefes Arch Exp Ophthamol 1927; 59:271-286. **3.** Alward WLM, Krasnow MA, Keech RV, Pulido JS *et al* Persistent hyperplastic primary vitreous with glaucoma presenting in infancy. Arch Ophthalmol 1991; 109:1063-1064

P336 SAETHRE-CHOTZEN SYNDROME HOW TO IMPLEMENT COMPLIANCE WHEN A DIFFICULT CLINICAL CASE.

M.A. Moussalli, A. Baronetto, J.C. Casiraghi
Hospital de Clinicas, Buenos Aires, Argentina

Introduction: To present a rare genetic syndrome which prevalence is 1/50.000. It is an inherited craniosynostotic condition with both premature fusion of cranial sutures (craniostenosis) and limb abnormalities. The most common clinical features, present in more than a third of patients, consist of coronal synostosis, brachycephaly, low frontal hairline, facial asymetry, hypertelorism, broad halluces, congenital disorder, deafness, depression, congenital heart defects, respiratory problems, mental disarrangement and clinodactyly.
The estimated birth incidence is 1/25.000 to 1/50.000 but because the phenotype can be very mild, the entity is likely to be underdiagnosed. SCS is inherited as an autosomal dominant trait with a high penetrance and variable expression. The TWIST gene located at chromosome 7p21-p22, is responsible. Regarding ocular findings, this syndrome causes orbital malformation, strabismus, ptosis, exophtalmos, optical atrophy and corneal disorders. Up to now, this one would be the only case study associated with glaucoma. The difficulty to start up by a responsible diagnoses to set up the right treatment is shown. In order to acquire this, the following is needed: Understanding, Target intraocular preassure, Compliance,Tolerance, Effectiveness, Minimal ocular and systemic disorders.
Design*:* Description of a derived patient to Glaucoma Service. Semiological examination was made. Family medical history questionnaire with negative response. Ophtalmological routinary test. Ultrasound pachymetry, Octopus visual field, Tension curve, eye angle examination with gonio lens, refraction, miomicroscopy, optic disk examination with 60d lens.
Controls: Twenty-one-year-old male with Saethre-Chotzen syndrome, facial dysmorphism, including ptosis, low frontal hairline, nasal deviation with high bridge, proptosis, angled ears, scolliosis and torticollis, clinodactyly, large halluces, neurosensorial hypoacusia, depression and difficulty in communicating. He came to us with a visual acuity of RE 20/25with CYL-3 at 180° and LE 20/30 with CYL-3.5 at 160°; an ocular pressure elevated up to RE 29mmHg and LE 32mmHg. He also presented keratitis and corneal ulcer.
Methods: Bilateral keratoconus with leucoma in LE and corneal central thickness: RE 537uM LE 450uM Biomicroscopy: a slight iris hypoplasia. Eye angle: open. Retard of the iris root in the nasal inferior region. Wide ciliary band, pigmentation changes and some iridial processes. Optic disk: RE 0.4 LE 0.6. both a little pale. Visual field: RE MD 0.5 - LV 4.8 LE MD 10.1 – LV 12.3
Main outcome measures: This glaucoma was defined as congenital, retard and inherited; associated with chromosomic disorders. It is decided to treat the patient with latanoprost and artificial tears to improve the corneal state.
Results: The patient well tolerated the medication and understood treatment with good communication and compliance. The daily tension curve was RE/LE 20/22, 18/19, 17/17, 17/18, 21/23. According to the patients clinical situation and pachymetry, with a prior consign of the cardiologist, was decided to add Timolol with Latanoprost in the same formula. We obtained this new tension curve (with minimal dry eye and a follow-up of the patient): RE/LE 16/18, 14/15, 13/14, 14/14, 14/15.
Conclusion: The ophthalmological studies have contributed broadly to the clinical delineation of genetic disorders, providing an up-to-date understanding of certain conditions before counseling patients and families. With good comprehension between professionals and patients, and a deep study of the clinical case, it is possible to come to positive results and get a good quality of life for the patients.
References:
1. Clauser L,Galie M,Hassanipour A, Calabrese O, Saethre-Chotzen Syndrome: Review of the Literature and Report of a case. J.of Craniofacial surgery; 11/5:480-486,2000. **2.** Cristofori G, Fillipi G, Saethre-Chotzen Syndrome with Trigonocephaly.am J Med Genett;44:611-4,1992. **3.** Hampton Roy F.Sindrome de Crouzon. Sindromes oculares y enfermedades sistémicas, Salvat Ed.;1990. **4.** Howard TA,Paznekas WA,Green ED *et al*: Mutations in TWIST, a basic helix transcription factor, in Saethre-Chotzen Syndrome. Nat Genet.15:36-41,1997. **5.** Robin NH.Molecular Genetic Advances in understanding craniosynostosis.Plast.reconstr.Surg.103:1060-70,1999. **6.** Sampaolesi Roberto.Glaucomas pediátricos. Clasificación:Glaucoma.58.667-671,1991. **7.** Tessier P.Cronofacial surgery in sindromatic craniosinostosis. Craniosynostosis: Diagnosis,evaluation and management.New York, Raven Press.321-411,1986. **8.** Von Gernet-S, Schuffenhauer S,Golla A *et al.* Craniosynostosis Suggestive of Saethre-Chotzen Syndrome: Clinical description of a large kindred and exclusion of candidate regions on 7p.American Journal of Medical Genetics.15/1:42-46,1997

INDEX OF AUTHORS

Behind the author names, the numbers of the abstract have been listed.
O is for Opening Sessions, D for Didactic Sessions, C for Courses and P for Posters.

C

D

E

F

G

H

I

J

K

Q

R

S

T

ALPHABETICAL CONTENTS LIST