AGS Mission Statement

The mission of the American Glaucoma Society is to promote excellence in the care of patients with glaucoma and preserve or enhance vision by supporting glaucoma specialists and scientists through the advancement of education and research.

The American Glaucoma Society thanks

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For supporting the educational portions of the 2013 Annual Meeting.

Letter of Welcome

Welcome to San Francisco, where we gather for the 23rd Annual Meeting of the American Glaucoma Society!

Your Program Committee, chaired by Neeru Gupta and including Joseph Caprioli, Ronald Fellman, David Friedman, Christopher Girkin, David Greenfield, Malik Kahook, Michele Lim, Doug Rhee, Carla Siegfried and Arthur Sit, has worked diligently to create an outstanding agenda which broadly covers our field. The large number of abstract submissions for this year's meeting has made it possible to offer both quality and quantity in the balance of papers, posters, and symposia which comprise the final program. Based largely on AGS member responses to online surveys regarding the meeting, we have maintained our formula of a successful mix of mini-symposia, free papers, and discussion time. The total number of podium presentations remains steady relative to recent years, and the number of poster presentations has been expanded for the 2013 Annual Meeting. We will continue to use the Audience Response System that was successfully introduced at the 2012 meeting.

The Honoree for the 2013 AGS Annual Meeting is Robert Ritch of New York, NY. The AGS Lecture (Friday afternoon) will be presented by Richard K. Parrish, II of Miami, FL. The 14th AGS Clinician-Scientist Lecture (Saturday afternoon) will be presented by Jeffrey M. Liebmann of New York, NY. The recipient of the 2013 AGS President's Award is Cynthia Mattox of Boston, MA. The 4th annual AGS Glaucoma Surgery Day Lecturer is Marlene R. Moster of Philadelphia, PA. The recipient of the AGS Innovator Award is Robert N. Weinreb of La Jolla, CA and the recipient of the AGS International Scholar Award is Ivan Goldberg of Vaucluse, Australia. Last year, the AGS created a new award to honor the contributions of our colleagues who have worked selflessly to improve health care in underserved areas nationally and around the world. The recipient of the 2nd annual AGS Outstanding Humanitarian Award is Marc F. Lieberman of San Francisco, CA.

The 4th annual AGS Glaucoma Surgery Day, organized by Ronald Fellman and Christopher Girkin, will be held on Thursday, February 28th and is devoted to novel and traditional approaches to glaucoma surgery. We will kick off Surgery Day with a moderated surgical poster session, followed by a symposium jointly sponsored by the AGS and ASCRS entitled *Good to Great: Improving your Technique for Challenging Cases*. On Thursday evening, just prior to the opening reception, we will hear from Abraham Verghese, MD, MACP, Senior Associate Chair, and Professor of the Theory and Practice of Medicine in the Department of Medicine at Stanford University, who is both an accomplished physician and author. Dr. Verghese's first novel, *Cutting for Stone*, has been #2 on the New York Times bestseller list. Following the guest lecture, we will gather to catch up with existing friends and colleagues as well as meet new AGS members and guests during the Welcome Reception at the beautiful City View Event Space at the Metreon, just steps away from the San Francisco Marriott Marquis.

Friday morning will begin with a sunrise yoga session followed by a second moderated poster session. Two free paper sessions will be held along with three symposia on *What's New in Glaucoma Science?*, *Glaucoma Practitioner, Academic and State Affairs,* and *Achieving IOP Targets in Clinical Practice*. Friday will end with our Gala Reception and Banquet where we will enjoy dancing to music performed by our very own, Neil Choplin and the Flip Side Band.

On Saturday morning, plan to join us for the AGS Fun Run/Walk where you can enjoy either a brisk run or walk through San Francisco's South of Market district and along the Embarcadero. There will be a third moderated poster session and oral presentations beginning with two free paper sessions and an exciting symposium entitled *Update on Managing Inflammatory Glaucomas*. An afternoon Special Interest Group will highlight important issues pertaining to early, mid-career and senior Clinician Scientists. The length of the Saturday afternoon sessions has been reduced again this year to allow ample opportunity to enjoy shopping, museums and other exciting events in the San Francisco area.

As in past years, we start early on Sunday morning, with seven concurrent Breakfast Roundtable Discussions beginning at 7 am. These discussions, entitled *Trabeculectomy Re-Visited: Modern Tweaks to Reduce Complications, Minimally Invasive Glaucoma Surgery (MIGS) for My Patients, What To Do When a Tube is Not Enough, Managing Glaucoma During Pregnancy, Slit Lamp Procedures 101, Recognition and Treatment of Malignant Glaucoma,* and *Management of Hypotony in Glaucom*a will allow small group interaction in a casual setting. There will be one Special Interest Group entitled *The EHR: Special Needs for Glaucoma*. We will end this year's meeting with two concurrent workshops that have been very well received for many years: the Super Bowl of Grand Rounds as well as Coding and E-Prescribing.

We look forward to welcoming our colleagues and friends to the 23rd AGS Annual Meeting in San Francisco, and hope that you will find it stimulating, highly informative and personally rewarding.

Kuldev Singh, MD, MPH
President

Neeru Gupta, MD, PhD, MBA
Program Chair

Contents

Leadership and Program Committee

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Program Committee

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Christopher A. Girkin, MD, MSPH – Vice Chair & Surgery Day Chair
Joseph A. Caprioli, MD
Ronald L. Fellman, MD – Surgery Day, Co-Chair
David S. Friedman, MD, MPH, PhD
David S. Greenfield, MD – Ex-Officio
Malik Y. Kahook, MD
Michele C. Lim, MD
Douglas J. Rhee, MD
Carla J. Siegfried, MD
Arthur J. Sit, SM, MD

Goal of the AGS Annual Meeting

The goal of this meeting is to provide members and guests of the American Glaucoma Society a professionally stimulating forum in which they can exchange information and ideas regarding the diagnosis and treatment of glaucoma and present new developments in glaucoma research.

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This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the American Academy of Ophthalmology and the American Glaucoma Society. The American Academy of Ophthalmology is accredited by the ACCME to provide continuing medical education for physicians.

The American Academy of Ophthalmology designates this live activity for a maximum of *27 AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

AGS Foundation

AMERICAN GLAUCOMA SOCIETY FOUNDATION

Mission of the Foundation

The mission of the American Glaucoma Society Foundation (AGSF) is to support glaucoma research and education and to promote excellence in the care of patients with glaucoma.

The Board of Directors is charged with overseeing these efforts by identifying unmet needs, devising strategies to address them, and advancing the field through support of research, education and training.

Each of the stakeholders in our field (patients, clinicians, scientists, industry, government and non-governmental organizations) plays a vital role; collaboration is critical for success. We strive to support and create programs that will make the difference in our field and for our patients.

Help us make a difference!

Board of Directors

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AGS Policies

AGS Annual Meeting Conflict of Interest Issues

The AGS Program Committee takes conflicts of interest very seriously and expects all AGS Members to do the same. All participants in the program have submitted a financial disclosure form in addition to a conflict resolution form that has been reviewed by the Program Chair and Vice Chair. An example of the conflict resolution form is below. If you have any concerns about the content or perceived conflicts of interest in the Annual Program, please bring this to the attention of the Program Chair, Dr. Neeru Gupta, or Vice Chair, Dr. Christopher A. Girkin, or the Chair of the AGS Ethics Task Force, Dr. David S. Greenfield as soon as possible.

Example of Financial Conflict Resolution Form

All financial conflicts of interest must be resolved. CME providers require that everyone who is in a position to control the content of an educational activity disclose all relevant financial relationships with any commercial interest within the past 12 months. Those whose conflicts are not resolved must be disqualified.

Please select one or more that apply to resolve your conflict.

There is a conflict of interest related to the content material, and you must:

- limit the conflict to report information that is related to the conflicted without recommendations
- reference the "best available evidence in literature," the grade or level of that evidence and identify the conclusions that the evidence supports
- step aside and allow someone else to present
- discontinue your relationship with the commercial entity

Diversity Policy

The board of Directors of the American Glaucoma Society recognizes that this organization is best served by representation from the broadest possible diversity of member background, experience, and professional activities setting. As a policy, the Board of Directors is committed to diverse representation on the Board and its committees and staff without regard to race, religion, national origin, sexual orientation, age, gender, or physical disability.

Disclosure and Resolution of Conflict of Interest Policy

AGS ensures that all leaders, volunteers, staff, or any individuals in planning and production of AGS activities will disclose any and all potential conflict of interest and resolve them prior to the activity.

Procedure

The process for ensuring compliance with this policy applies a multi-step approach including prevention and monitoring/evaluation.

Identification

All individuals who are involved with planning activities must sign and submit a financial disclosure form prior to planning the activity. All financial relationships with any commercial interest must be disclosed. Individuals subject to this requirement include, but are not limited to activity course directors and program chairs, planning

committee members, faculty/speakers/presenters, authors, editors, expert reviewers, moderators, panel members, and AGS staff in position to control content. All financial disclosures must be provided through the AGS online disclosure form or in another pre-approved format.

Relevant financial relationships must be disclosed to learners prior to the continuing education activity. Information provided in this manner includes the name of the individual, the name of the commercial interest, and the nature of the relationship the person has with the each commercial interest. Information that an individual has no relevant financial relationship must also be disclosed in advance to the learning audience.

Resolution

All faculty and non-faculty involved with the planning or instructing an activity who discloses a conflict of interest must resolve that conflict prior to the activity. Appropriate mechanisms for resolution will be identified by the planning committee and can include the following:

Non-Faculty Resolution
A non-faculty member e.g. staff, who has an identified conflict of interest will be asked to excuse themselves from any discussion/decision making process where the conflict of interest would come into play.

Faculty Member Resolution
Peer Review: A faculty member with a conflict of interest must submit his/her work to a panel for peer review. Recommendations of the panel, as it relates to conflict, must be taken. If the faculty member refuses the recommendation they will be asked to resign and a new faculty member will be appointed.

Or
Evidence Based: Material to be presented must be the best available evidence in the literature, supported by the grade or level of that evidence and by identifying the conclusions that the evidence is supports.

Or
Other methods deemed appropriate by AGS.

Refusal to Disclose

Non-Faculty
If a non-faculty member refuses to disclose conflicts of interest then that person will be asked to step down from the position requiring disclosure of conflicts of interest.

Faculty Member
If a faculty member refuses to disclose they will be replaced and not considered to present until such disclosures are made.

Additional Information
Additional information may be requested of faculty/non-faculty to assist in the resolution of conflict of interest. Resolution of the conflict of interest must also be disclosed to the audience in advance.

Off-Label Disclosure
In addition, all faculty members are required to disclose to learners off-label and/or investigational use of a product and any limitations on the information presented, including preliminary data, anecdotal evidence or unsupported opinion.

Evaluation/Monitoring for Bias

CME activity participants are surveyed about perceived commercial bias as part of the post-activity evaluation.

AGS BOD Approved – March 2010

CME Financial Disclosures of Board of Directors, Program Committee and Participants

Category	Code	Description
Consultant/Advisor	C	Consultant fee, paid advisory boards or fees for attending a meeting (for the past 1 year)
Employee	E	Employed by a commercial entity
Lecture Fees	L	Lecture fees (honoraria), travel fees or reimbursements when speaking at the invitation of a commercial entity (for the past 1 year)
Equity Owner	O	Equity ownership/stock options of publicly or privately traded firms (excluding mutual funds) with manufacturers of commercial ophthalmic products or commercial ophthalmic
Patents/Royalty	P	Patents and/or royalties that might be viewed as creating a potential conflict of interest
Grant Support	S	Grant support for the past 1 year (all sources) and all sources used for this project if this form is an update for a specific talk or manuscript with no time limitation

Board of Directors

Budenz, MD, MPH, Donald L.
C – Alcon Inc, Alimera, Ivantis Inc, Santen Inc, Sucampo
L – Merck Inc
S – Carl Zeiss Meditec Inc, New World Medical

Cioffi, MD, George A.
C – Allergan Inc, Pfizer Inc

Feldman, MD, Robert M.
C – Alcon Inc, Merck Inc
L – Alcon Inc, Merck Inc
S – Alcon Inc, Allergan Inc, Lux Biosciences, NEI P30EY010608, Pfizer Inc, Research to Prevent Blindness, Hermann Eye Fund, CASIA SS-1000 loan from Tomey Corporation

Girkin, MD, MSPH, Christopher A.
S – Centers for Disease Control, Eyesight Foundation of Alabama, Heidelberg Engineering, NEI, Research to Prevent Blindness, SOLX

Greenfield, MD, David S.
C – Allergan Inc, Merz Pharmaceuticals Inc, Quark Pharmaceuticals Inc, SOLX, Biometric Imaging, Senju
S – Carl Zeiss Meditec Inc, Heidelberg Engineering, NIH R01 EY013516, Optovue Inc

Gupta, MD, PhD, MBA, Neeru
S – Canadian Institutes of Health Research

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C – Allergan Inc, Aerie, Alcon Inc, Glaukos Corp, Bausch and Lomb, Sucampo, Inotek
L – Allergan Inc, Alcon Inc, Merck Inc, Lumenis
S – Aeon Astron, Allergan Inc, Aerie Pharmaceuticals, Inotek, Merck Inc

Krupin, MD, Theodore
Nothing to Disclose

Liebmann, MD, Jeffrey M.
C – Alcon Inc, Allergan Inc, Diopsys Corp, Merz Pharmaceuticals Inc, Optovue Inc, Quark Pharmaceuticals Inc
S – Carl Zeiss Meditec Inc, Diopsys Corp, Glaukos Corp, Heidelberg Engineering, NEI, New York Glaucoma Research Institute, Optovue Inc, SOLX, Topcon Medical Systems Inc

Mansberger, MD, MPH, Steven L.
C – Alcon Inc, Allergan Inc, Santen Inc
L – Merck Inc
S – Allergan Inc, Centers for Disease Control and Prevention, Merck Inc, NEI

Mattox, MD, Cynthia
C – Allergan Inc
S – AHRQ, Alcon Inc, NEI, NIH, Transcend Medical Inc

Samuelson, MD, Thomas W.
C – Abbott Medical Optics, AcuMems, Alcon Inc, Allergan Inc, Aquesys Inc, EndoOptiks, Glaukos Corp, Ivantis Inc, Merck Inc, Ocular Surgery News, QLT, Santen Inc, Slack Inc

Singh, MD, MPH, Kuldev
C – Alcon Inc, Allergan Inc, Amakem, Bausch and Lomb, iScience Interventional, Santen Inc, Sucampo, Transcend Medical Inc, Ivantis Inc

Sit, SM, MD, Arthur J.
C – Alcon Inc, Allergan Inc
S – American Health Assistance Foundation, Glaukos Corp, Mayo Foundation for Medical Education and Research, Research to Prevent Blindness

Program Committee

Caprioli, MD, Joseph A.
C – Allergan Inc
S – Allergan Inc, Alcon Inc, Merck Inc, Abbott Medical Optics

Lim, MD, Michele C.
Nothing to Disclose

Fellman, MD, Ronald L.
C – EndoOptiks
S – Glaukos Corp, iScience Interventional, Ivantis Inc, Transcend Medical Inc

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C – Allergan Inc, Merz Pharmaceuticals Inc, Quark Pharmaceuticals Inc, SOLX, Biometric Imaging, Senju
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Gupta, MD, PhD, MBA, Neeru
S – Canadian Institutes of Health Research

Kahook, MD, Malik Y.
C – Alcon Inc, Allergan Inc, Clarvista Medical, Merck Inc, Bausch and Lomb, Glaukos Corp, Ivantis Inc, US Food and Drug Administration
O – Clarvista Medical, Innovative Laser Solutions, ShapeOphthalmics, ShapeTech
P – Abbott Medical Optics, Clarvista Medical, Dose Medical, Glaukos Corp, Innovative Laser Solutions, ShapeOphthalmics, ShapeTech
S – Abbott Medical Optics, Alcon Inc, Allergan Inc, Clarvista Medical, Dose Medical, Genentech, Glaukos Corp, Merck Inc, State of Colorado, Regeneron

Rhee, MD, Douglas J.
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Siegfried, MD, Carla J.
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Sit, MD, Arthur J.
C – Alcon Inc, Allergan Inc
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Ahmed, MD, Iqbal I.
C – Abbott Medical Optics, ACE Vision Group, Ade Therapeutics, Alcon Inc, Allergan Inc, Aquesys, Carl Zeiss Meditec Inc, Clarity Medical Systems, EndoOptiks, Eyelight, Glaukos Corp, Ivantis Inc, ONO Pharma, Sensimed, SOLX, Stroma, Transcend Medical Inc

Asrani, MD, Sanjay
L – Heidelberg Engineering Inc

Aung, MD, Tin
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L – Alcon Inc, Allergan Inc, Carl Zeiss Meditec Inc, Ellex, Santen Inc
S – Alcon Inc, Allergan Inc, Aquesys Inc, Carl Zeiss Meditec Inc, Ellex, Ocular Therapeutix

Ayyala, MD, Ramesh S.
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C – Glaukos Corp
O – Glaukos Corp

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S – Merck Inc, Refocus

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S – Research to Prevent Blindness

Beiser, Julia A.
S – NIH EY09341

Bell, MD, Nicholas P.
S – Hermann Eye Fund, NEI P30EY010608, Research to Prevent Blindness
L –Merck Inc

Blieden, MD, Lauren S.
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Borras, PhD, FARVO, Terete
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Campbell, PhD, Joanna C.
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Carey, MD, Malcolm J.
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Castellarin, MD, Alessandro
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L – Genentech
P – Alcon Inc

Cha, MS, Elliot D.K.
S – NIH EY 018712/R01EY022634, Massachusetts Lions Eye Research Foundation Inc

Chang, MD, David F.
C – Abbott Medical Optics, Clarity Medical Systems, LensAR, Transcend Medical Inc
L – Allergan Inc, Carl Zeiss Meditec Inc
O – Calhoun Vision, One Focus Ventures, Revital Vision, ICON Bioscience
P – EyeMaginations, Glaukos Corp, Slack

Chang, MD, Robert T.
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S – Carl Zeiss Meditec Inc

Chew, MD, Paul
S – Ocular Therapeutix

Chuang, PhD, Alice Z.
S – Hermann Eye Fund, NEI P30EY010608, Research to Prevent Blindness

Cioffi, MD, George A.
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Cook, PhD, Paul F.
C – Merck Inc

Coroneo, MD, MS, MSc, FRACS, FRANZCO, Minas T.
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Costarides, MD, Anastasios
S – Research to Prevent Blindness

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C – Alcon Inc, Aquesys Inc, ASICO, Glaucoma Today, Glaukos Corp, I-Science, Ivantis Inc, Omeros, Transcend Medical Inc, Vimetrics
L – Alcon Inc, Allergan Inc

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S – Transcend Medical Inc

Crichton, MD, FRCSC, Andrew
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L – Allergan Inc
S – Canadian Institute of Health Research

DeBry, MD, Peter W.
L – Merck Inc, Abbott Medical Optics

Deokule, MD, Sunil
L – Alcon Inc, Allergan Inc

Dickey, PhD, Chad A.
S – American Health Assistance Foundation, NIH

Epstein, MD, David L.
C – Glaukos Corp
O – AERIE Pharmaceuticals

Erb, MD, Carl
S – Sensimed

Fechtner, MD, Robert D.
C – Alcon Inc, Allergan Inc, Merck Inc
L – Alcon Inc, Allergan Inc, Merck Inc

Feldman, MD, Robert M.
C – Alcon Inc, Merck Inc
L – Alcon Inc, Merck Inc
S – Alcon Inc, Allergan Inc, Lux Biosciences, NEI P30EY010608, Pfizer Inc, Research to Prevent Blindness, Hermann Eye Fund, CASIA SS-1000 loan from Tomey Corporation

Fellman, MD, Ronald L.
C – EndoOptiks
S – Glaukos Corp, iScience Interventional, Ivantis Inc, Transcend Medical Inc

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Flowers, MD, Brian E.
C – Transcend Medical Inc

Francis, MD, Brian
C – Neomedix

Freiberg, MD, Florentina J.
S – Sensimed

Friedman, MD, MPH, PhD, David S.
C – Bausch and Lomb, Merck Inc, Pfizer Inc, QLT Inc

Fujimoto, PhD, James G.
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Gagné, MD, FRCSC, Sébastien
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Gao, PhD, Feng
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Gedde, MD, Steven J.
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Giaconi, MD, JoAnn A.
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Giangiacomo, MD, Annette
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Goedkoop, MD, Rene
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Goldberg, MD, PhD, Jeffrey L.
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L – Alcon Inc
O – Emmetrope
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Gong, MD, PhD, Haiyan
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Goode, MD, Stephen M.
C – Alcon Inc

Gordon, PhD, Mae O.
S – Horncrest Foundation Awards, Merck Research Laboratories, NIH EY09341/EY09307/062687/ P30EY02687, Vision Core Grant, Pfizer Inc, RPB, White House Station New Jersey

Gower, PhD, Emil W.
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Grajewski, MD, Alana L.
C – Alcon Inc
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Greenfield, MD, David S.
C – Allergan Inc, Merz Pharmaceuticals Inc, Quark, SOLX, Biometric Imaging, Senju
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Harasymowycz, MD, FRCSC, Paul
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L – Abbott Medical Optics, Alcon Inc, Allergan Inc, Bausch and Lomb, Merck Inc, Novartis, Pfizer Inc
S – Quebec Glaucoma Foundation, Ivantis Inc

Helm, PhD, Jonathan E.
P – Univ of MI patent 010109-11001P
S – MICHR, National Science Foundation

Herndon, Jr, MD, Leon W.
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O – Sight Sciences

Heuer, MD, Dale K.
C – Aeon Astron (DSMB Member), Aerie Pharmaceuticals (via unrestricted grant to Jobson Publishing), Lux Biosciences (DSMB Chair)
L – Alcon Inc (via unrestricted grant to Jobson Publishing)

Hoeh, MD, FEBO, Helmut
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Huang, MD, PhD, David
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O – Optovue Inc
P – Optovue Inc, Carl Zeiss Meditec Inc
S – NIH R01 EY013516, Optovue Inc

Hutnik, MD, PhD, Cindy M.
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L – Alcon Inc Canada, Allergan Inc Canada, Bausch and Lomb, Merck Frosst Canada Inc, Pfizer Inc
S – Merck Frosst Canada Inc

Jampel, MD, MHS, Henry D.
C – Allergan Inc, Airie Pharmaceuticals, EndoOptiks, Intersect ENT, Ivantis Inc, Transcend Medical Inc
O – Allergan Inc
S – Transcend Medical Inc

Jia, PhD, Yali
P – Optovue Inc

Jin, MS, Rui
S – Massachusetts Lions Eye Research Foundation Inc, NIH EY 018712/ R01EY022634

Jinapriya, MD, Delan
L – Alcon Inc Canada

Johnstone, MD, Murray A.
C – Allergan Inc, Alcon Inc, Ivantis Inc
O – Cascade Ophthalmics, Healionics
P – Allergan Inc

Joslin, OD, PhD, Charlotte E.
S – NIH/NCMHHD P60 MD003424, NIH/NCMHHD P60 MD003424S

Kahook, MD, Malik Y.
C – Alcon Inc, Allergan Inc, Clarvista Medical, Merck Inc, Bausch and Lomb, Glaukos Corp, Ivantis Inc, US Food and Drug Administration
O – Clarvista Medical, Innovative Laser Solutions, ShapeOphthalmics, ShapeTech
P – Abbott Medical Optics, Clarvista Medical, Dose Medical, Glaukos Corp, Innovative Laser Solutions, ShapeOphthalmics, ShapeTech
S – Abbott Medical Optics, Alcon Inc, Allergan Inc, Clarvista Medical, Dose Medical, Genentech, Glaukos Corp, Merck Inc, State of Colorado, Regeneron

Kammer, MD, Jeffrey
C – Allergan Inc
L – Allergan Inc, Merck Inc
S – Merck Inc

Kang, ScD, Jae H.
S – NEI

Kass, MD, Michael A.
C – Pfizer Inc
S – Horncrest Research Laboratories, NIH EY09341/EY09307/062687, Pfizer Inc, RPB, White House Station New Jersey

Katz, MD, L. Jay
C – Allergan Inc, Aerie, Alcon Inc, Glaukos Corp, Bausch and Lomb, Sucampo, Inotek
L – Allergan Inc, Alcon Inc, Merck Inc, Lumenis
S – Aeon Astron, Allergan Inc, Aerie Pharmaceuticals, Inotek, Merck Inc

Klink, MD, PhD, Thomas
S – Sensimed

Kopczynski, PhD, Casey C.
E – Aerie Pharmaceuticals

Kouri, MD, Albert S.
L – Alcon Inc, Allergan Inc, Kowa, Merck Inc

Kowalski, PharmD, MS, Jonathan
E – Allergan Inc

LaBounty, PhD, Britni
C – Principled Strategies

Lanchulev, MD, MPH, Tsontcho
E – Transcend Medical Inc

Lavieri, PhD, Mariel S.
P – Univ of MI patent 010109-11001P
S – MICHR, National Science Foundation

Lehrer, MD, Richard A.
C – Alcon Inc, Bausch and Lomb
L – Alcon Inc

Levy, OD, MS, Brian A.
E – Aerie Pharmaceuticals

Lewis, MD, Richard A.
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L – Merck Inc

Liebmann, MD, Jeffrey M.
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S – Carl Zeiss Meditec Inc, Diopsys Corp, Glaukos Corp, Heidelberg Engineering, NEI, New York Glaucoma Research Institute, Optovue Inc, SOLX, Topcon Medical Systems Inc

Lin, MD, Shan C.
C – Allergan Inc, Merck Inc

Lisboa, MD, Renato
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Liu, PhD, John H.K.
S – Sensimed

Loewen, MD, PhD, Nils A.
L – Neomedix (former instructor)

Lorenz, MD, Katrin
L – Sensimed
S – Sensimed

Mansberger, MD, MPH, Steven L.
C – Alcon Inc, Allergan Inc, Santen Inc
L – Merck Inc
S – Allergan Inc, Centers for Disease Control and Prevention, Merck Inc, NEI

Mansouri, MD, Kaweh
C – Sensimed
S – Sensimed

Mattox, MD, Cynthia
C – Allergan Inc
S – AHRQ, Alcon Inc, NEI, NIH, Transcend Medical Inc

McMenemy, MD, Matthew G.
C – Alcon Inc, Bausch and Lomb
L – Alcon Inc, Allergan Inc, Bausch and Lomb, Merck Inc
S – Abbott Medical Optics, Alcon Inc, Sunpharma

Medeiros, MD, Felipe A.
C – Carl Zeiss Meditec Inc, Heildelberg Engineering
S – Alcon Inc, Allergan Inc, Carl Zeiss Meditec Inc, Merck Inc, Heidelberg Engineering, NEI EY021818, Sensimed

Mermoud, MD, Andre
S – Sensimed

Miller, AB, J. Phillip
S – NIH EY09341

Miller Ellis, MD, Eydie
C – Alcon Inc, Allergan Inc, Merck Inc, ONO Pharma

Minnal, MD, Vandana
S – Research to Prevent Blindness

Moroi, MD, PhD, Sayoko E.
P – LWW
S – Merck Inc, NIH EY022124

Moster, MD, Marlene R.
C – Alcon Inc, Allergan Inc, Ista Pharmaceuticals, Merck Inc
L – Alcon Inc, Allergan Inc, iScience Interventional, Ista Pharmaceuticals, Merck Inc, SOLX
S – Alcon Inc, Allergan Inc, Genentech, Tissue Tech Inc

Muir, MD, Kelly W.
S – VA Career Development Award

Musch, PhD, David C.
C – Aquesys Inc, InnFocus LLC, Ivantis Inc, Glaucos Corp
S – NIH EY018690
P – Univ of MI patent 010109-11001P

Myers, MD, Jonathan S.
C – Allergan Inc, Inotek, Sucampo
L – Alson Inc, Allergan Inc, Merck Inc
S – Aeon Astron, Alcon Inc, Allergan Inc, Aquesys Inc, Glaukos Corp, Inotek, Merck Inc

Neelakantan, MD, Arvind
C – Allergan Inc
L – Alcon Inc, Allergan Inc, Merck Inc
S – Transcend Medical Inc

Newman-Casey, MD, Paula A.
S – Blue Cross Blue Shield of Michigan McDevitt Award, Heed Foundation Fellowship

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S – Hermann Eye Fund, NEI P30EY010608, Research to Prevent Blindness

Nguyen, Quang H.
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S – Transcend Medical Inc

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S – Glaukos Corp

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Novack, PhD, Gary D.
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Olivier, MD, Mildred M.G.
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L – Alcon Inc, Allergan Inc
S – NIH R 13 Grant

Ong, MD, Tuyen
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Packer, MD, Mark
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S – Transcend Medical Inc

Palmberg, MD, PhD, Paul F.
C – Aeon (Ologen DSMB), Aquesys Inc, Aurolab (unpaid), Innovia: In Focus
S – Abbott Medical Optics (TVT)

Parke, II, MD, David
C – OMIC

Parrish, II, MD, Richard K.
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O – Aquesys Inc, Glaukos Corp, InnFocus Inc, Innolene LLC, Vitalspring Technologies Inc
S – NEI, Strobis Foundation

Pasquale, MD, Louis R.
S – NEI

Patel, PharmD, MS, Vaishali D.
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Perera, MBBS, MSc, FRCOphth, Shamira A.
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S – Ocular Therapeutix

Perkins, MD, Todd, W.
C – Emmes Corp

Pfeiffer, MD, Norbert
C – Ivantis Inc
S – Sensimed

Piltz-Seymour, MD, Jody R.
S – Alcon Inc, Allergan Inc, Merck Inc

Pruett, MD, Paul
S – Research to Prevent Blindness

Quigley, MD, Harry A.
C – Merck Inc, Genetech, GreyBug, Sensimed, Sucampo
P – Ganglion Cell Genes
S – NIH/NEI, private donors

Radcliffe, MD, Nathan M.
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Realini, MD, MPH, Anthony
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L – Lumenis

Rhee, MD, Douglas J.
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S – Alcon Inc, Aquesys Inc, Merck Inc

Rich, III, MD, William L.
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Ricks, BS, Christopher J.
S – Hermann Eye Fund, NEI P30EY010608, Research to Prevent Blindness

Ritch, MD, Robert
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P – Ocular Instruments Inc
S – Ralph and Sylvia Ablon Research Fund of the New York Glaucoma Research Institute

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L – Allergan Inc, Merck Inc

Rockwood, MD, Edward J.
L – Merck Inc

Sadda, MD, Srinivas
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S – Carl Zeiss Meditec Inc, Optos, Optovue Inc

Salim, MD, Sarwat
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Samuelson, MD, Thomas W.
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L – Alcon Inc, IOP Inc
S – Aeon Astron, Aquasys, Glaukos Corp, Transcend Medical Inc

Scassellati Sforzolini, MD, PhD, Baldo
E – Bausch and Lomb

Schell, MS, Greggory
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S – MICHR, National Science Foundation

Schultz, MD, Jeffrey
S – Research to Prevent Blindness

Schuman, MD, Joel S.
P – Carl Zeiss Meditec Inc
S – Carl Zeiss Meditec Inc, NIH R44 EY018986/R01-EY013178/ R01-EY011289/P30-EY008098, The Eye and Ear Foundation

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L – Allergan Inc, Tissue Bank International
S – Allergan Inc

Sehi, PhD, Mitra
C – Allergan Inc

Serle, MD, Janet B.
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L – New World Medical
S – Aerie Pharmaceuticals, Fovea

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S – Alcon Inc, Allergan Inc

Siegfried, MD, Carla J.
S – NEI

Simon-Zoula, PhD, Sonja C.
E – Sensimed

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Sit, MD, Arthur J.
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L – Allergan Inc
S – SOLX, Transcend Medical Inc

Sokol, MD, Joseph L.
L – Compulink Business Systems

Spaeth, MD, George L.
L – Alcon Inc, Allergan Inc, Merck Inc, Pfizer Inc
S – Alcon Inc, Allergan Inc, Merck Inc, Pfizer Inc

Stamper, MD, Robert L.
C – Transcend Medical Inc
O – iScience Interventional
P – iScience Interventional
S – Transcend Medical Inc

Stein, MD, MS, Joshua D.
P – Univ of MI patent 010109-11001P
S – MICHR, National Science Foundation

Szirth, PhD, Ben
C – Canon

Tan, MD, PhD, James C.
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S – Optovue Inc

Tanna, MD, Angelo P.
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L – Merck Inc

Tello, MD, Celso
C – Diopsys, SOLX
L – Alcon Inc, Allergan Inc

Tetz, MD, Manfred
C – Ivantis Inc

Toeteberg-Harms, MD, Marc
S – Swiss National Science Foundation (SNSF Project No. PBZHP3_141457)

Toris, PhD, Carol B.
C – Ivantis Inc, Glaukos Corp
S – Alcon Inc, Allergan Inc, Ivantis Inc, Glaukos Corp

Trick, PhD, Gary L.
C – Allergan Inc

Tseng, MD, PhD, Henry
S – K08, Research to Prevent Blindness

Vajaranant, MD, Thasarat S.
S – The Komarek-McQueen-Hyde Glaucoma Research Fund in an honor of Dr. Mark Lunde K12HD055892

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S – MICHR, National Science Foundation

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C – Alcon Inc, Aquesys Inc, Carl Zeiss Meditec Inc, Forsight Labs, Glaukos Corp, InnFocus, Iridex, iScience Interventional, Ivantis Inc, Transcend Medical Inc Medical
L – Allergan Inc, Merck Inc, NeoMedix
O – Ocunetics, TrueVision Systems
S – Aeon Astron, QLT, SOLX

Voskanyan, MD, PhD, Lilit
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Wasserman, MD, Pierre
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E – PanOptica, Inc

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Weiss, MD, Mark J.
C – Aerie Pharmaceuticals, Alcon Inc, Allergan Inc

Whitson, MD, Jess T.
L – Alcon Inc, Allergan Inc, Merck Inc

Wiggs, MD, PhD, Janey L.
S – NEI

Williams, MA, BS, Julia M.
E – Allergan Inc

Wilson, MD, MS, M. Roy
E - NIH

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S – Carl Zeiss Meditec Inc, GmbH, Heidelberg Engineering, NEI EY11008/EY14267, Optovue Inc, Topcon Medical Systems Inc

Zink, MD, Jeffrey
L – Merck Inc

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S – iScience Interventional

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Wright, MD, Tracy M.
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Yang, PhD, Hongli
Yanovitch, MD, Tammy
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Zhang, PhD, Xinbo

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Meeting Objectives

After attending this program, participants should be able to:

- Describe recent medical advances in the diagnosis, management, and treatment of glaucoma in US and the world.
- Discuss different diagnostic and prognostic tools and new clinical research and advances in glaucoma in order to provide the best possible treatment options and care to patients.
- Critically evaluate/explain new and traditional types of glaucoma surgery.
- Examine and discuss advances in glaucoma science and implications for glaucoma therapy.

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CME Credit

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the American Academy of Ophthalmology and the American Glaucoma Society. The American Academy of Ophthalmology is accredited by the ACCME to provide continuing medical education for physicians.

The American Academy of Ophthalmology designates this live activity for a maximum of *27 AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Claim your CME credits using the online form on the AGS website, www.americanglaucomasociety.net.

Target Audience

The target audience for the American Glaucoma Society's Annual Meeting is glaucoma specialists, ophthalmologists, and researchers, practicing physicians, ophthalmology residents and fellows.

Exhibits

Plan to visit the exhibits located in Salon 8, located on the lower B2 level of The San Francisco Marriott Marquis. Exhibiting companies will showcase the newest and most innovative ophthalmic products and services.

Spouse and Guest Hospitality

The AGS Spouse and Guest Hospitality Room at The Marriott Marquis will be open and available for registered spouses and guests as follows:

Thursday, February 28	8:30 AM – 10:30 AM	Pacific Suite B
Friday, March 1	8:30 AM – 10:30 AM	Pacific Suite B
Saturday, March 2	8:00 AM – 10:30 AM	Pacific Suite B

Pacific Suite B is located on the fourth floor of the hotel.

2014 Annual Meeting Program Submissions

For those interested in submitting an abstract for the 2014 Annual Meeting, the online electronic submission program will be available in September 2013. Please visit the American Glaucoma Society's website, www.americanglaucomasociety.net, to submit an online abstract by the deadline.

Registration Information

Attendance Verification

Attendees must verify their attendance to claim CME credit for attending the Annual Meeting. Please refer to CME Credit in the previous section for more information.

Attendence verification letters will be available at the North Registration Desk, located on the lower B2 level of the San Francisco Marriott Marquis from Wednesday, February 27 – Sunday, March 3.

Registration Locations and Hours

Registration will be located on the lower B2 level from Wednesday, February 27 – Sunday, March 3. Any questions about the meeting, posters, and/or social functions may be answered at this location. The Speaker Ready Station located in Salon 15, will be available February 27. Registered participants will receive their badge and meeting materials at the registration desk. The registration desk will be open as follows:

Wednesday, February 27	5:00 PM – 8:00 PM
Thursday, February 28	6:00 AM – 6:30 PM
Friday, March 1	7:00 AM – 6:00 PM
Saturday, March 2	7:00 AM – 4:00 PM
Sunday, March 3	7:00 AM – 11:00 AM

Payment of Fees

The American Glaucoma Society accepts cash, checks payable to AGS, MasterCard, and Visa.

Social Events

The following social events are included in the registration fee:

Day/Date/Event	Time	Location/Room
Thursday, February 28		
Continental Breakfast	7:00 AM – 8:15 AM	Salon 8
Special Guest Speaker	6:00 PM – 6:30 PM	Offsite, City View at Metreon
Welcome Reception	6:30 PM – 8:00 PM	Offsite, City View at Metreon
Friday, March 1		
Morning Yoga	6:00 AM – 6:50 AM	Pacific Suite A
Continental Breakfast	6:30 AM – 8:00 AM	Salon 8
Gala Reception	7:00 PM – 8:00 PM	Yerba Buena Grand Assembly
Gala	8:00 PM – 10:00 PM	Salon 9
Saturday, March 2		
Casual Group Run	5:45 AM – 6:50 AM	North Registration
Continental Breakfast	7:00 AM – 8:15 AM	Salon 8
Sunday, March 3		
Breakfast Roundtables	7:00 AM – 8:00 AM	Salon 9

Messages

There will be a message board at the North Registration Desk. Please check for messages.

Posters

Posters will be displayed outside of Salon 10 throughout the entire meeting. Please check the section on Posters for listings.

Exhibits

Stop by and visit the hall in Salon 8 of The San Francisco Marriott Marquis throughout the entire meeting.

Registration Amenities

AGS Member/Non-Member registration includes: printed materials, giveaway item/s, daily continental breakfasts and breaks, welcome reception, gala reception & dinner, special guest lecture, and morning yoga.

Spouse/Personal Guest registration includes: use of the spouse/guest hospitality room, daily continental breakfasts, welcome reception, gala reception & dinner, special guest lecture, yoga.

Schedule at a Glance

WEDNESDAY, FEBRUARY 27

Registration & Exhibitor Check-In	5:00 PM – 8:00 PM	North Registration
Exhibitor Installation	5:00 PM – 8:00 PM	Salon 8

THURSDAY, FEBRUARY 28 – SURGERY DAY

Registration & Exhibitor Check-In	6:00 AM – 6:30 PM	North Registration
Poster Set-up (1-41)	6:00 AM – 7:00 AM	Left of South Registration, outside Salon 10
Breakfast – Exhibit Hall	7:00 AM – 8:00 AM	Salon 8
Exhibit Hall Viewing	7:00 AM – 3:40 PM	
Poster Viewing (1-41)	7:00 AM – 5:00 PM	Left of South Registration, outside Salon 10
Spouse Guest Hospitality Room	8:30 AM – 10:30 AM	Pacific Suite B
Concierge Visit to Hospitality Room	9:30 AM – 10:15 AM	Pacific Suite B
Surgery Poster Session with Authors 1st Round (1-41) CME	7:00 AM – 8:00 AM	Left of South Registration, outside Salon 10
Welcome and Introduction	8:00 AM – 8:03 AM	Salon 9
Surgery Day Section 1/Symposium 1 – ASCRS: Good to Great: Improving Your Technique for Challenging Cases CME	8:03 AM – 9:03 AM	
Surgery Day Section 2 -Glaucoma Procedures: Back to the Future CME	9:03 AM – 10:03 AM	
Break – Exhibit Hall	10:03 AM – 10:35 AM	Salon 8
Surgery Day Section 3 -Paper Presentations 1-5 CME	10:35 AM – 11:35 AM	Salon 9
Innovator Award Presented by Neeru Gupta, MD, PhD, MBA	11:35 AM – 11:40 AM	
Glaucoma Surgery Day Lecture – Glaucoma Surgery: Where We are Now and Where We are Going CME	11:40 AM – 12:13 PM	
Announcements	12:13 PM – 12:15 PM	
Lunch – On your own	12:15 PM – 1:45 PM	
Surgery Day Section 4 – Surgical Videos CME	1:45 PM – 2:25 PM	
Surgery Day Section 5 – Angle Surgery in Adults CME	2:25 PM – 3:25 PM	
Surgery Day Section 6 – Pathophysiology and Operative Approaches to Chronic Angle Closure Glaucoma CME	3:25 PM – 4:25 PM	
Surgery Day Section 7 – Facing the Unexpected: Managing Complications With Newer Procedures CME	4:25 PM – 5:25 PM	
Poster Tear Down (1-41)	5:00 PM – 5:45 PM	Left of South Registration, outside Salon 10
Poster Set Up (42-74)	5:45 PM – 6:30 PM	
Special Guest Lecture – Abraham Verghese, MD, MACP	6:00 PM – 6:30 PM	Offsite, City View at Metreon
Welcome Reception	6:30 PM – 8:00 PM	Offsite, City View at Metreon

FRIDAY, MARCH 1

Morning Yoga	6:00 AM – 6:50 AM	Pacific Suite A
Continental Breakfast – Exhibit Hall	7:00 AM – 8:15 AM	Salon 8
Registration	7:00 AM – 6:00 PM	North Registration
Exhibitor Viewing	7:00 AM – 4:30 PM	Salon 8
Poster Viewing (42-74)	7:00 AM – 5:00 PM	Left of South Registration, outside Salon 10
Spouse Guest Hospitality Room	8:30 AM – 10:30 AM	Pacific Suite B
Poster Session with Authors 2nd Round (42-74) CME	7:00 AM – 8:00 AM	Left of South Registration, outside Salon 10
Announcements	8:00 AM – 8:05 AM	Salon 9
Paper Presentations 6-10 CME	8:05 AM – 9:05 AM	
Symposium 2 – What's New in Glaucoma Science? CME	9:05 AM – 10:35 AM	
Break – Exhibit Hall	10:35 AM – 10:55 AM	Salon 8
Symposium 3 – Glaucoma Practitioner, Academic and State Affairs CME	10:55 AM – 12:25 PM	Salon 9
AGS Annual Business Meeting	12:25 PM – 12:55 PM	
Group Photo	12:55 PM – 1:10 PM	
Lunch – On your own	1:10 PM – 2:40 PM	
Symposium 4 – Achieving IOP Targets in Clinical Practice CME	2:40 PM – 4:07 PM	Salon 9
Break – Exhibit Hall	4:07 PM – 4:27 PM	Salon 8
Paper Presentations 11-15 CME	4:27 PM – 5:27 PM	Salon 9
23rd Annual AGS Lecture: What Can We Do With What We Know? – Improving Glaucoma Care in the Haitian American Community in South Florida – Richard K. Parrish, II, MD CME	5:27 PM – 6:00 PM	Salon 9
Poster Tear-Down (42-74)	5:00 PM – 5:30 PM	Left of South Registration, outside Salon 10
Poster Set-Up (75-114)	5:30 PM – 6:00 PM	
Gala Reception	7:00 PM – 8:00 PM	Yerba Buena Grand Assembly
Gala Banquet and Dinner	8:00 PM – 10:00 PM	Salon 9

SATURDAY, MARCH 2

Casual Group Run	5:45 AM – 6:50 AM	Meet group at North Registration
Breakfast – Exhibit Hall	7:00 AM – 8:15 AM	Salon 8
Registration	7:00 AM – 4:00 PM	North Registration
Exhibit Viewing	7:00 AM – 11:00 AM	Salon 8
Poster Viewing (75-114)	7:00 AM – 3:30 PM	Left of South Registration, outside Salon 10
Spouse Guest Hospitality Room	8:30 AM – 10:30 AM	Pacific Suite B
Poster Session with Authors – 3rd Round (75-114) CME	7:00 AM – 8:00 AM	Left of South Registration, outside Salon 10
Announcements	8:00 AM – 8:05 AM	Salon 9
Paper Presentations 16-20 CME	8:05 AM – 9:05 AM	Salon 9
Symposium 5 – Update on Managing Inflammatory Glaucomas CME	9:05 AM – 10:50 AM	Salon 9

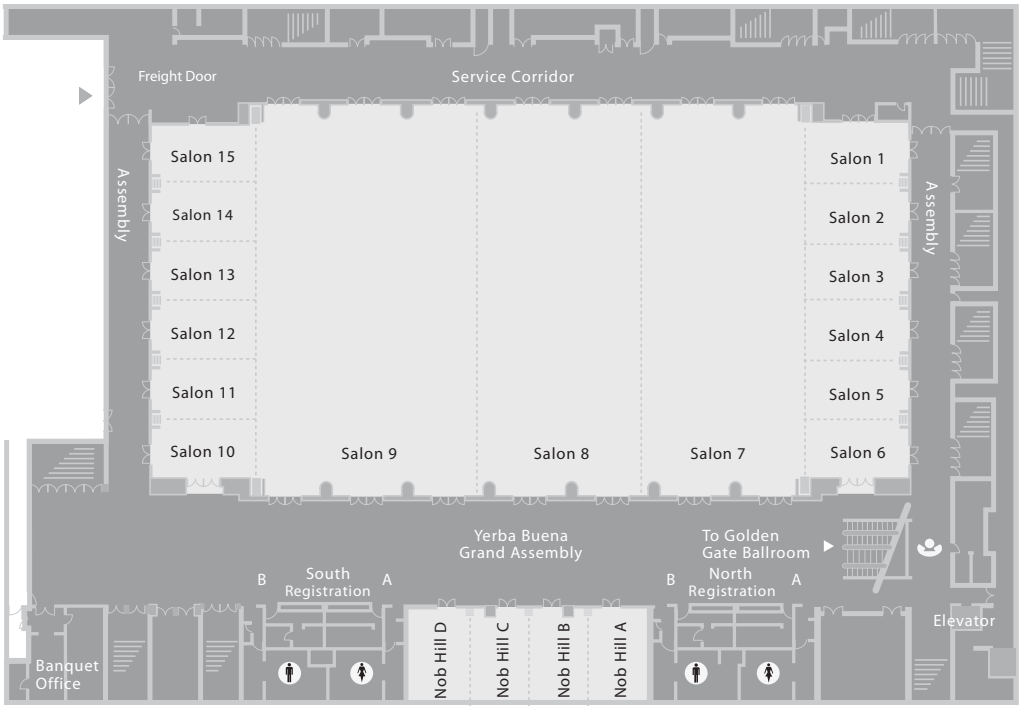
Break – Exhibit Hall	10:50 AM – 11:10 AM	Salon 8
Paper Presentations 21-25 CME	11:10 AM – 12:10 PM	Salon 9
Clinician-Scientist Lecture – The Central Ten Degrees CME	12:10 PM – 12:50 PM	Salon 9
Lunch – On your own	12:50 PM – 2:30 PM	
Special Interest Group – The EHR: Special Needs for Glaucoma CME	2:30 PM – 4:00 PM	Salon 9
Exhibitor Tear-Down	11:15 AM – 4:00 PM	Salon 8
Poster Tear-Down (75-114)	3:30 PM – 4:00 PM	Left of South Registration, outside Salon 10

SUNDAY, MARCH 3

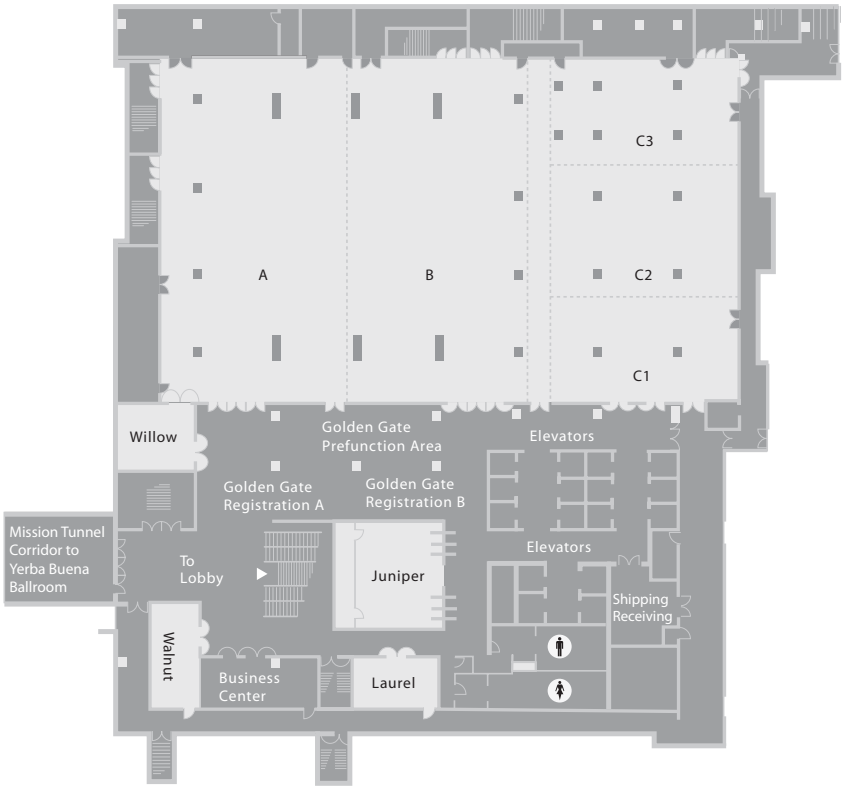
Registration	7:00 AM – 11:00 AM	North Registration
Breakfast Roundtable Discussions CME	7:00 AM – 8:00 AM	Salon 9
Trabeculectomy Re-Visited: Modern Tweaks to Reduce Complications		
Minimally Invasive Glaucoma Surgery (MIGS) for My Patients?		
What To Do When a Tube is Not Enough		
Managing Glaucoma During Pregnancy		
Slit Lamp Procedures 101		
Recognition and Treatment of Malignant Glaucoma		
Management of Hypotony in Glaucoma		
Workshops CME	8:00 AM – 11:00 AM	
Superbowl of Grand Rounds		Salon 10-12
Coding, PQRS/E-Prescribing and Transitioning to ICD-10-CM		Salon 13-15

Hotel Map

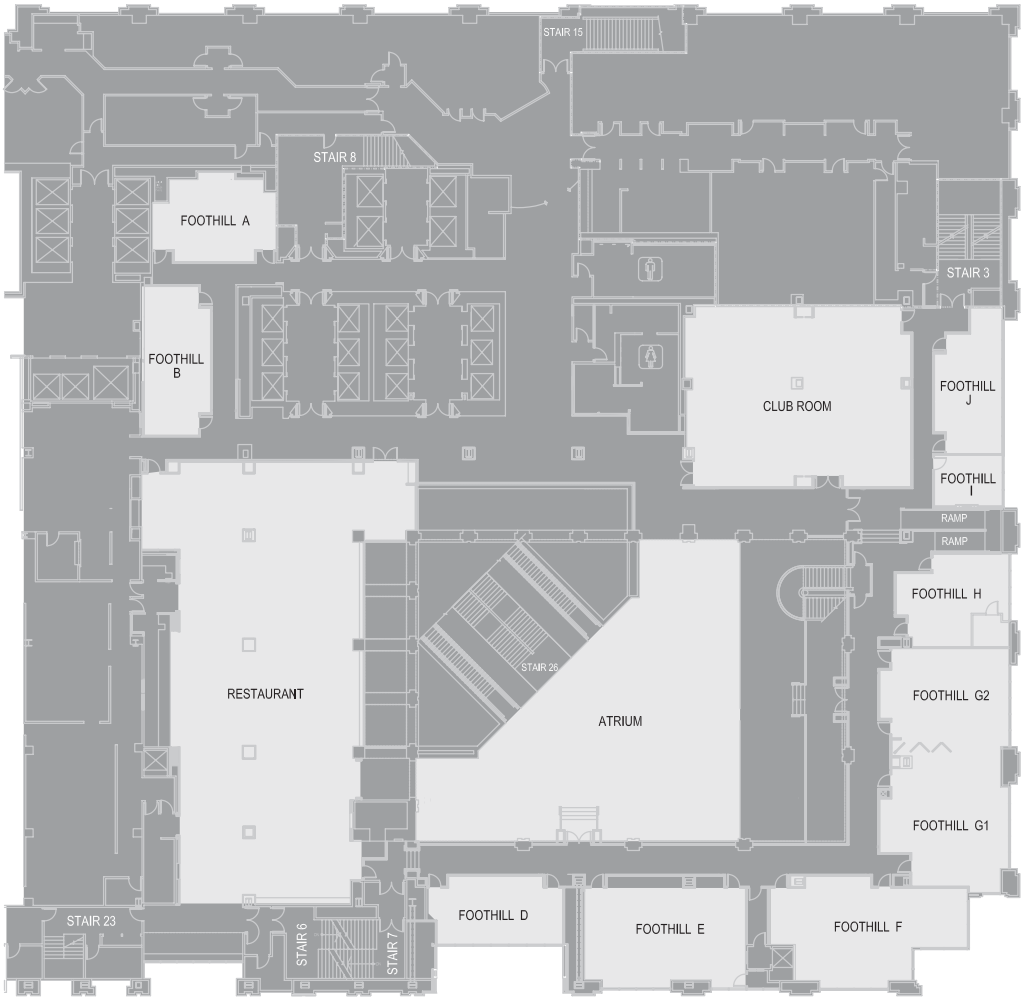
Yerba Buena Ballroom



Golden Gate Ballroom

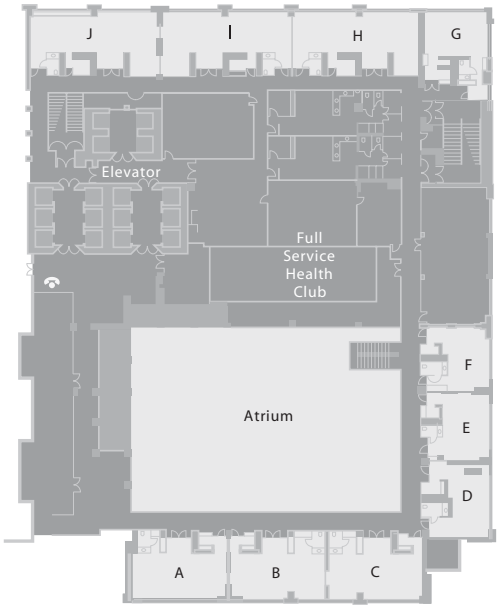


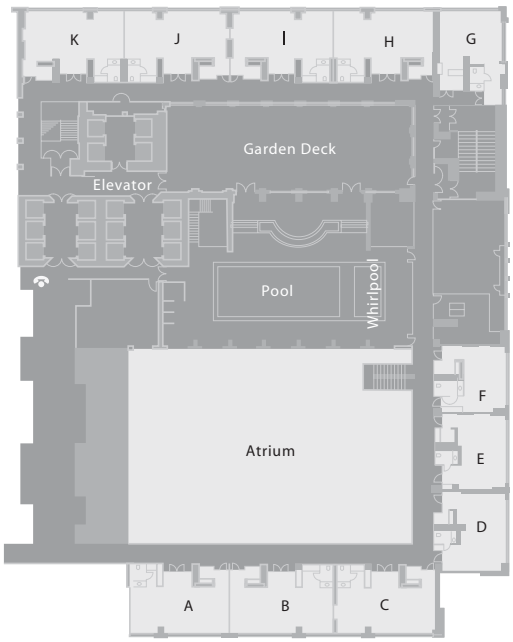
Meeting Rooms



Pacific Sierra Conference Maps

Pacific
(Fourth Floor)





Sierra
(Fifth Floor)

History of the AGS

The American Glaucoma Society was founded in 1985 with the stated purpose to "maintain and improve the quality of patient care primarily through improvement, exchange and dissemination of information and scientific knowledge pertinent to glaucoma and related diseases."

Although Drs. Douglas Anderson and Jonathan Herschler had organized the very successful Annual North American Glaucomatologists' Learning Ensemble (ANGLE) in the 1970s to provide in-depth focus on glaucoma research topics of mutual interest, insightful members of the glaucoma community felt that an additional forum for both clinical and scientific interchange among glaucoma specialists was needed.

In May 1984, Drs. Max Forbes and Bruce Shields began to discuss the concept of an American Glaucoma Society. Drs. George Spaeth and Richard Simmons subsequently were persuaded to join in formalizing this concept and help organize the American Glaucoma Society. Nine other leading members of the glaucoma community also were recruited to participate in this endeavor. An initial meeting of the group took place in Atlanta on November 11, 1984, at which everyone's full agreement and cooperation was established.

Dr. Simmons prepared a Constitution and Bylaws for the American Glaucoma Society, which was incorporated in the Commonwealth of Massachusetts on August 30, 1985. The 13 founding members subsequently approved the Constitution and Bylaws in San Francisco, California, on September 29, 1985. The first elected officers included George L. Spaeth, President; Richard J. Simmons, Vice-President; Harry A. Quigley, Secretary; and John Hetherington, Jr., Treasurer. The new executive committee met in the spring of 1986, at which time a list of invitations to sixty-nine Charter Members was compiled. In 1986, 82 individuals became charter members of the newly formed Society.

In honor and memory of Dr. Charles D. Phelps, one of the founding members and former chair of the Department of Ophthalmology at the University of Iowa, who died in September, 1985, the first meeting of the American Glaucoma Society was held in Iowa City, Iowa, in June, 1987. Dr. M. Bruce Shields served as chair of the Program Committee for the Society's inaugural meeting as well as the next four, and Dr. Stephen Drance delivered the first American Glaucoma Society Lecture. A Washington Hawthorne tree was planted in Dr. Phelps' memory and still stands on the University of Iowa Medical Center campus, just outside of the office of the Chair of the Department of Ophthalmology and Visual Science.

In Iowa City, Dr. Spaeth quoted Sir Winston Churchill by stating that, "We are at the beginning of the beginning." Twenty-seven years and 22 meetings later, the American Glaucoma Society has grown to include over 870 members and has become one of American ophthalmology's premier and most influential subspecialty societies.

In Memoriam

Francisco E. Fantes, MD
1954-2012

Thirteen Founding Members of the American Glaucoma Society

George L. Spaeth, MD
Richard J. Simmons, MD
M. Bruce Shields, MD
Max Forbes, MD
Douglas R. Anderson, MD
David G. Campbell, MD
John Hetherington Jr., MD
H. Dunbar Hoskins Jr., MD
Allan E. Kolker, MD
William E. Layden, MD
Charles D. Phelps, MD*
Irvin P. Pollack, MD
Harry A. Quigley, MD

Additional 69 Charter Members of the American Glaucoma Society

Robert C. Allen, MD*
Jorge A. Alvarado, MD
Mansour F. Armaly, MD*
Frank S. Ashburn Jr., MD
George S. Baerveldt, MD
Bernard Becker, MD
Hugh Beckman, MD
C. Davis Belcher III, MD*
A. Robert Bellows, MD
Richard F. Brubaker, MD
Paul A. Chandler, MD*
John S. Cohen, MD
Marshall N. Cyrlin, MD
Gordon R. Douglas, MD, FRCSC
StephenM. Drance, MD
David K. Dueker, MD
David L. Epstein, MD
Douglas E. Gaasterland, MD
Joseph S. Haas, MD
Thomas S. Harbin Jr., MD
Sohan S. Hayreh, MD, DSc
Jonathan Herschler, MD
Elizabeth A. Hodapp, MD
B. Thomas Hutchinson, MD
Murray A. Johnstone, MD
Frederick M. Kapetansky, MD
Michael A. Kass, MD
Paul L. Kaufman, MD
Edwin U. Keates, MD
Theodore Krupin, MD
Carl Kupfer, MD*
Raymond P. LeBlanc, MD
Pei-Fei Lee, MD*
Ralph Z. Levene, MD*
Paul R. Lichter, MD
Alan I.Mandell, MD*
Wayne F.March, MD*
A. Edward Maumenee, MD*
Samuel D.McPherson, Jr., MD*
DavidW.Meltzer, MD, PhD
Donald S.Minckler, MD
Donald J.Morin, MD*
Robert A.Moses, MD*
Paul F. Palmberg, MD, PhD
Richard K. Parrish II, MD
Jonathan E. Pederson, MD
Edward S. Perkins, MD
StevenM. Podos, MD*
Ronald L. Radius, MD
Kenneth T. Richardson, Jr., MD
ThomasM. Richardson, MD
Robert Ritch, MD
Alan L. Robin, MD
Harold G. Scheie, MD*
Arthur L. Schwartz, MD
Bernard Schwartz, MD, PhD*
Marvin L. Sears, MD
Robert N. Shaffer, MD*
Jess A. Smith, MD*
Robert L. Stamper, MD
H. Saul Sugar, MD*
John V. Thomas, MD
E.Michael Van Buskirk, MD
Paul A.Weber, MD
Robert N.Weinreb, MD
Elliot B.Werner, MD
Jacob T.Wilensky, MD
Michael E. Yablonksi, MD, PhD*
Thom J. Zimmerman, MD, PhD*

*Deceased

AGS Meetings

Date and Location	Honoree	AGS Lecturer
June 11–13, 1987, Iowa City, Iowa	Charles D. Phelps, MD	Stephen M. Drance, MD
December 2–4, 1988, Miami Lakes, Florida	Paul A. Chandler, MD	Richard J. Simmons, MD
July 6–7, 1990, Mackinac Island, Michigan	David Worthen, MD	Richard F. Brubaker, MD
December 12–14, 1991, Coronado, California	H. Saul Sugar, MD	David G. Campbell, MD
July 7–9, 1993, Reykjavik, Iceland (Joint meeting with the European Glaucoma Society)	Hans Goldmann, MD	Franz Fankhauser, MD
February 2–4, 1995, Key West, Florida	Bernard Becker, MD	Allan E. Kolker, MD
July 30–August 2, 1996, Vancouver, British Columbia, Canada (Joint meeting with the Japanese Glaucoma Society)	Stephen M. Drance, MD	Gordon R. Douglas, MD
December 4–6, 1997, Scottsdale, Arizona	Robert N. Shaffer, MD	H. Dunbar Hoskins Jr., MD
February 18–20, 1999, Amelia Island, Florida	W. Morton Grant, MD	Douglas R. Anderson, MD
March 2–4, 2000, San Antonio, Texas	Marvin L. Sears, MD	M. Bruce Shields, MD
March 1–4, 2001, Newport Beach, California	George L. Spaeth, MD	Roger Hitchings, MD
February 28–March 3, 2002, San Juan, Puerto Rico	Allan E. Kolker, MD	Theodore Krupin, MD
March 6–9, 2003, San Francisco, California	Richard J. Simmons, MD	E. Michael Van Buskirk, MD
March 4–7, 2004, Sarasota, Florida	Douglas R. Anderson, MD	Chris A. Johnson, PhD
March 3–6, 2005, Snowbird, Utah	Richard F. Brubaker, MD	David L. Epstein, MD
March 2–5, 2006, Charleston, South Carolina	E. Michael Van Buskirk, MD	Murray A. Johnstone, MD
March 1–4, 2007, San Francisco, California	Steven M. Podos, MD	Paul L. Kaufman, MD
March 6–9, 2008, Washington, District of Columbia	M. Bruce Shields, MD	Robert Ritch, MD
March 5–8, 2009, San Diego, California	Paul L. Kaufman, MD	Robert N. Weinreb, MD
March 4–7, 2010, Naples, Florida	Robert L. Stamper, MD	Michael A. Kass, MD
March 3–6, 2011, Dana Point, California	Richard P. Wilson, MD	Harry A. Quigley, MD
March 1–4, 2012, New York, New York	Theodore Krupin, MD	Alfred Sommer, MD, MHS
February 28–March 3, 2013, San Francisco, California	Robert Ritch, MD	Richard K. Parrish, II, MD

Clinician-Scientist Lecturers & President's Award Recipients

The American Glaucoma Society Clinician-Scientist Lecture is given annually by an individual who exemplifies qualities of excellence in patient care and basic research. This individual is selected by a special committee of the AGS comprised of past, present and future AGS Presidents and the AGS Program Chair. The AGS Clinician-Scientist Lecturer is invited to present a special scientific lecture at the AGS Annual Meeting.

Year	Clinician-Scientist Lecturer	Lecture
2000	Robert N. Weinreb, MD	The Other Outflow Pathway
2001	Paul L. Kaufman, MD	Gene Therapy for Glaucoma: Anterior and Posterior Segment Targets and Constraints
2002	Harry A. Quigley, MD	Do We Really Understand Angle-Closure Glaucoma?
2003	Martin B. Wax, MD	Roles of the Immune System in Glaucoma
2004	Wallace L. M. Alward, MD	Computer Geeks in the Genome: Bioinformatics
2005	Douglas H. Johnson, MD	Glaucoma: Clues from Ultrastructure, Lessons from Epidemiology
2006	George A. Cioffi, MD	Quotes, Questions & Quandaries Regarding Optic Nerve Ischemia & Glaucoma
2007	Carl B. Camras, MD	Serendipity versus Directed Hypothesis Driven Research in Medical Discovery
2008	Anne L. Coleman, MD, PhD	A Public Health Perspective on Glaucoma
2009	Joseph Caprioli, MD	The Importance of Rates in Glaucoma
2010	David S. Greenfield, MD	Unlocking Mysteries in Measurements of the Retinal Nerve Fiber Layer
2011	Joel S. Schuman, MD	Advances in Optical Coherence Tomography (OCT)
2012	James D. Brandt, MD	Is It Real or Is It Artifact? What the Cornea Can Tell Us About Glaucoma
2013	Jeffrey M. Liebmann, MD	The Central Ten Degrees

The recipient of the AGS President's Award is chosen by the President and approved by a special committee of the AGS comprised of past, present, and future AGS Presidents and the AGS Program Chair for "significant contributions to the glaucoma community through his or her scientific achievements, service to the Society, and/or service to the profession as a whole."

Year	President's Award Recipient
2003	Ronald L. Fellman, MD
2004	Theodore Krupin, MD
2005	B. Thomas Hutchinson, MD
2006	Max Forbes, MD
2007	Bernard Schwartz, MD, PhD
2008	Glaucoma Foundation Glaucoma Research Foundation
2009	H. Dunbar Hoskins Jr., MD William L. Rich III, MD
2010	AGS Founding Members: Douglas R. Anderson, MD David G. Campbell, MD Max Forbes, MD John Hetherington Jr., MD H. Dunbar Hoskins Jr., MD Allan E. Kolker, MD William E. Layden, MD Charles D. Phelps, MD* Irvin P. Pollack, MD Harry A. Quigley, MD M. Bruce Shields, MD Richard J. Simmons, MD George L. Spaeth, MD
2011	Richard P. Mills, MD, MPH James F. Jorkasky
2012	Joanne Angle
2013	Cynthia Mattox, MD

*Deceased

Research Fellowship Awards and Programs

The American Glaucoma Society Research Fellowship supports developing new investigators in the field of glaucoma research. The program is administered by the AGS Research Committee.

The 1997-2012 recipients are listed below. The recipients of the 2013 grants will be announced during the 2013 Annual Business Meeting.

Recipients will be selected each year, although applications for renewals will be considered. To be eligible, a candidate must have completed, within the past five years, at least one full year of fellowship training in glaucoma. He or she does not necessarily need to have a faculty appointment, but must be an active or provisional member of the American Glaucoma Society. For more information, interested individuals may contact the AGS Administrative Office in San Francisco or visit the AGS website, www.americanglaucomasociety.net.

The American Glaucoma Society congratulates the past recipients of the AGS Research Fellowships in Glaucoma.

Recipients of the AGS Young Physician Scientist Grants

1997	Deepak P. Edward, MD
1998	Young H. Kwon, MD, PhD
1999	Darrell WuDunn, MD, PhD
2000	Stuart J. McKinnon, MD, PhD
2001	Margaret P. Good, MD
2002	Edward M. Barnett, MD, PhD
2003	Steven L. Mansberger, MD, MPH Christopher A. Girkin, MD Pratap Challa, MD
2004	Christopher A. Girkin, MD Steven L. Mansberger, MD, MPH Douglas J. Rhee, MD Richard K. Lee, MD, PhD Shan C. Lin, MD
2005	Camille Hylton, MD Douglas J. Rhee, MD Shan C. Lin, MD Leslie S. Jones, MD Jeffrey A. Kammer, MD
2006	JoAnn A. Giaconi, MD Anjali M. Bhorade, MD, MPH Sameer Imtiaz Ahmad, MD Molly M. Walsh, MD, MPH
2007	Dana M. Blumberg, MD John H. Fingert, MD, PhD Malik Y. Kahook, MD Rachel W. Kuchtey, MD, PhD Felipe A. Medeiros, MD, PhD Arthur J. Sit, MD
2008	Arthur J. Sit, MD John H. Fingert, MD Henry Tseng, MD, PhD Pradeep Y. Ramulu, MD, PhD Thasarat S. Vajaranant, MD Rachel W. Kuchtey, MD, PhD
2009	Michael V. Boland, MD, PhD Joshua D. Stein, MD, MS
2010	Brian Christopher Samuels MD, PhD Vikas Gulati, MD Christopher C. Teng, MD Molly M. Walsh, MD, MPH
2011	Kathryn E. Bollinger, MD, PhD Nils A. Loewen, MD, PhD Kelly W. Muir, MD Kouros Nouri-Mahdavi, MD Yang Sun, MD, PhD
2012	Yvonne Ou, MD Lucy Q. Shen, MD

Mid-Career Physician-Scientist Awards

These awards are designed to provide an additional source of research funding for investigators between 5 and 20 years out of fellowship. These grants can be competitively renewed for a second year if substantial progress has been made during the first year. These grants are meant to allow mid-career investigators to conduct initial new research or continue ongoing research.

Like the AGS research fellowship, the winners of the 2013 Mid-Career Physician-Scientist Awards will be announced at the Business Meeting.

Recipients of the Mid-Career Physician-Scientist Award

2008	Donald L. Budenz, MD, MPH Douglas J. Rhee, MD Sanjay G. Asrani, MD	2010	Claude F. Burgoyne, MD Felipe A. Medeiros, MD, PhD Anthony D. Realini, MD	2012	John H. Fingeret, MD John Danias, MD, PhD
2009	Edward M. Barnett, MD, PhD Cynthia L. Grosskreutz, MD, PhD Darrell WuDunn, MD, PhD	2011	Anjali Bhorade, MD Richard K. Lee, MD, PhD		

Thank you Alcon, Allergan, and Merck for support of the Research Fellowship Grants in one or both categories.

Mentoring for Advancement of Physician-Scientists (MAPS) Program

The MAPS Program is a multi-faceted mentoring program of the American Glaucoma Society (AGS) and predominant in fulfilling the mission of the organization by supporting glaucoma specialists and scientists to further their careers in science and research of glaucoma. The funding of this award provides AGS a vehicle to expand its reach to young physician-scientists and focus on providing tools and resources to further their careers as potential leaders in the specialty of glaucoma care.

Thank you Allergan for your continued support of the AGS MAPS Program.

MAPS Award Recipients

2012	Osamah J. Saeedi, MD Lauren S. Blieden, MD Yang Sun, MD, PhD Stella N. Arthur, MD James C.H. Tan, MD, FRCOphth, PhD Benjamin J. Frankfort, MD, PhD Joseph F. Panarelli, MD Tomas M. Grippo, MD Sung Chul Park, MD	2010	Kathryn E. Bollinger, MD, PhD Robert T. Chang, MD JoAnn A. Giaconi, MD Vikas Gulati, MD Kouros Nouri-Mahdavi, MD MSc Mina B. Pantcheva, MD Yang Sun, MD, PhD	2008	Constance O. Okeke MD, MSCE Pradeep Y. Ramulu, MD, PhD Zaher H. Sbeity MD, FEBO Misha F. Syed, MD Thasarat S. Vajaranant, MD Husam Ansari, MD, PhD Vandana K. Badlani, MD Annette L. Giangiacomo, MD Lesya M. Shuba, MD, PhD Arthur J. Sit, MS, MD Joshua D. Stein, MD, MS
2011	Derek S. Welsbie, MD Ta C. Chang, MD Albert S. Khouri, MD Mark A. Slabaugh, MD Ahmad A. Aref, MD Anand V. Mantravadi, MD Daniel J. Good, MD Anna-Maria Demetriades, MD Benjamin J. Frankfort, MD, PhD	2009	Kelly W. Muir, MD Scott J. Fudemberg, MD Nathan M.Radcliffe, MD Lucy Q. Shen, MD Misha F. Syed, MD Molly M. Walsh, MD Michael V. Boland, MD, PhD Nils A. Loewen, MD, PhD		

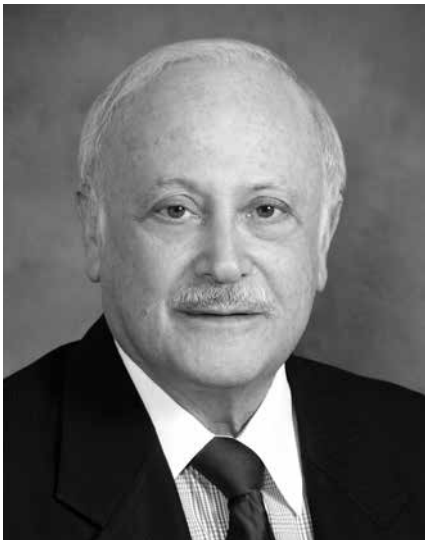
Recipients of the Bernard Schwartz, MD Memorial Award

The Bernard Schwartz memorial award was established in 2009 by a generous donation from Dr. Ralph Levene and Elsevier Publications.

The award is given annually to the top scored paper or poster abstract being presented at the Annual Meeting by a resident.

2009	Christopher Rodarte, MD	2012	Jennifer Hu, MD
2010	Denise S. Kim, MD	2013	Tracy M. Wright, MD
2011	Jennifer S. Huang, MD		

Lecturers and Honorees



Robert Ritch, MD

Guest of Honor

Robert Ritch, MD holds the Shelley and Steven Einhorn Distinguished Chair in Ophthalmology and Chief of Glaucoma Services at the New York Eye and Ear Infirmary, where he was Surgeon Director, and Professor of Ophthalmology at The New York Medical College. He has devoted his career to broadening our understanding of the underlying etiologies and mechanisms of glaucoma and innovation in its medical, laser, and surgical treatment.

Dr. Ritch received his BA and MA from Harvard, his MD from Albert Einstein and performed his residency at Mount Sinai, followed by fellowships in glaucoma from the Heed Foundation and the NIH. He is a Fellow of the AAO, ACS, Royal College of Ophthalmologists, and ARVO, and a member of over 35 scientific and medical societies. He has been President of the Ophthalmic Laser Surgical Society, New York Glaucoma Society, New York Academy of Medicine Section on Ophthalmology, and New York Society for Clinical Ophthalmology. He serves on numerous medical and scientific advisory and editorial boards and is a member of the Glaucoma Research Society, Steering Committee of the World Glaucoma Association, and Board of Directors of the Pan-American Association of Ophthalmology. He served on the Board of Trustees of ARVO and was Vice-President in 2006-2007. He is Chairman of the Advisory Committee to and member of the Board of Directors of the International Council of Ophthalmology and a member of Academia Ophthalmologica Internationalis.

His awards include the Heed Foundation Ophthalmologist of the Year, Gold Medal of the Greek Glaucoma Society, Louis Rudin Award, Jesse Neal Award for Editorial Achievement, Bernstein Award for outstanding contributions to medicine, AAO Lifetime Achievement Honor Award, Leadership in Education in Ophthalmology Award, Dean's Distinguished Research Award from the New York Medical College, Glaucoma Foundation Award for Innovation and Excellence in Glaucoma, TKC Liu Leadership Award, Dominick Purpura Distinguished Alumnus Award from Albert Einstein, HRH Prince Abdulaziz Al-Saud Prevention of Blindness Award, Jose Rizal International Medal, Maghraby International Achievement Award, and the inaugural Asia-Pacific Glaucoma Society International Award.

Dr. Ritch has co-authored or edited nine textbooks and over 1600 medical and scientific papers, chapters, articles and abstracts. He has presented nearly 700 lectures worldwide, including 35 named lectures. In 1983, he started the world's first glaucoma patient support group and in 1985, the Glaucoma Foundation. In 1994, he initiated the annual Optic Nerve Rescue and Regeneration Think Tank, which has attracted numerous researchers from other fields into glaucoma. He co-founded the New York Glaucoma Research Institute, World Glaucoma Patient Association, World Glaucoma Day/Week, Ophthalmic Laser Surgical Society, New York Glaucoma Society, Lindberg Society, ARVO Host-a-Researcher Program, and von Graefe Society.

He has trained over 130 clinical and research fellows, 50 International Council of Ophthalmology fellows and 120 observers from 50 countries. He has organized symposia, conferences, and medical training worldwide over the last 30 years, helped establish residency and teaching programs, and has made fundamental contributions to modernizing ophthalmology in Thailand, Malaysia, Philippines, Laos, Myanmar and other countries. There are Asian, Brazilian, and International Ritch Fellows Societies.

President's Award

Cynthia Mattox, MD

Cynthia Mattox, MD is an Associate Professor and Vice-Chair of the Department of Ophthalmology at Tufts University School of Medicine, where she is the Director of the Glaucoma and Cataract Service at the New England Eye Center in Boston, MA.

Dr. Mattox is actively involved with the American Academy of Ophthalmology, serving as the Associate Secretary for the Annual Meeting, and as a member of the AAO Health Policy Committee since 2004. She has been a member of the American Glaucoma Society Board of Directors since 2008, and currently serves as the Chair of the AGS Patient Care Committee, overseeing the projects of 8 subcommittees to ensure that policies affecting ophthalmologists allow for the effective care of glaucoma patients.

Along with her busy referral practice, over the past 20 years Dr. Mattox has trained 36 Glaucoma fellows and 80 Residents in the art and science of glaucoma and cataract management and surgery. She has received the Resident Teaching Award three times, as well as the Secretariat Award and the Senior Achievement Award from the American Academy of Ophthalmology. Dr. Mattox has been an invited lecturer at many meetings, has authored numerous book chapters, and is involved in clinical research.

In her free time, she enjoys biking, gardening, and windsurfing with her husband.

Marlene R. Moster, MD

Surgery Day Lecturer

Marlene R. Moster, MD is Professor of Ophthalmology at Thomas Jefferson Medicine College in Philadelphia, Pennsylvania. She is an attending surgeon at Wills Eye Institute and also holds appointments at Thomas Jefferson University Hospital, Drexel University College of Medicine, and Temple University School of Medicine.

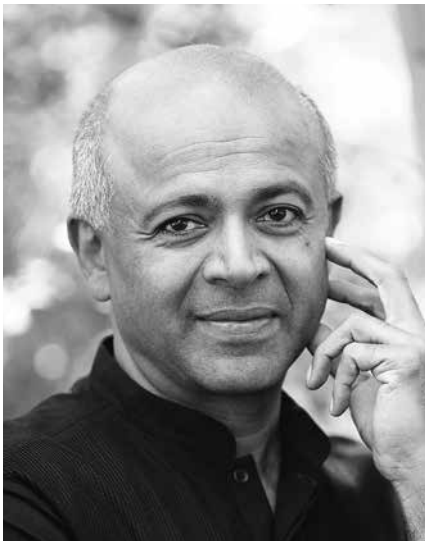
Dr. Moster graduated from SUNY Health Science Center at Syracuse, New York in 1979, underwent an ophthalmology residency at the University of Pittsburgh Eye and Ear Hospital, and subsequently a Glaucoma Fellowship at the Wills Eye Institute, Philadelphia. She is board certified in ophthalmology and licensed in Pennsylvania, New Jersey, and Delaware.

Dr. Moster has authored and co-authored over 80 peer-reviewed articles in various ophthalmologic journals. She has written many book chapters and has edited a book on Anesthesia in Ophthalmology. She also plays an important role in the evaluation of research material as a manuscript referee for the *American Journal of Ophthalmology, Ophthalmic Surgery and Lasers, and Journal of Glaucoma, British Journal of Ophthalmology*. She is a member of the Editorial Board for *Review of Ophthalmology and Glaucoma Today*.

Dr. Moster has participated in clinical research studies involving new drugs for glaucoma and advances in surgical techniques as well as educational programs and lectures affiliated with the Wills Eye Institute, the American Glaucoma Society, and the American Academy of Ophthalmology, among others. The focus of her participation is diagnosis, therapy, and surgical intervention for glaucoma.

Dr. Moster has received recognition for her professional and philanthropic involvement in the field of ophthalmology, including an appreciation award from Eye Care America for her volunteer services in providing eye care to the public. In 1999 she was appointed Coordinator for "Glaucoma 2001" for the state of Pennsylvania, a public service project of the Foundation of the American Academy of Ophthalmology. She has received many awards including the Physicians Recognition Award from the American Medical Association and a Senior Honor Award from the American Academy of Ophthalmology. Dr. Moster served on the 2011 program committee for the American Glaucoma Society and currently is serving on the Glaucoma program committee for the ASCRS. Dr. Moster has received recognition in publications including "Who's Who" (Marquis Who's Who LLC) and Philadelphia Magazine. She is a member of numerous medical and glaucoma related associations and has been listed in Best Doctors in America and "Top Doctors" in the Philadelphia area for many years. Dr. Moster has been invited to lecture nationally and internationally on surgical and medical treatment of glaucoma.

Special Guest Lecturer



Abraham Verghese, MD, MACP
Photo credit Barbi Reed © 2011

An infectious disease physician and best-selling author, **Abraham Verghese** is Senior Associate Chair, and Professor of the Theory and Practice of Medicine in the Department of Medicine at Stanford University.

His first novel, *Cutting for Stone,* published by Knopf in 2009, has been on the *New York Times* bestseller list for more than two years. His first book, *My Own Country,* a memoir about AIDS in rural Tennessee, was a finalist for the National Book Critics Circle Award and made into a movie. His second book, *The Tennis Partner,* was a *New York Times* notable book and a national bestseller. He has published extensively in the medical literature, and his writing has appeared in *The New Yorker, The Atlantic, The New York Times Magazine,* and *The Wall Street Journal,* among others.

Dr. Verghese is a strong advocate for bedside medicine and physical diagnosis, skills he sees as waning in an era of increasingly sophisticated medical technology, where the 'i-patient' in the computer increasingly diverts physicians' attention from the real patient in the hospital bed. At Stanford, he was instrumental in development of the "The Stanford 25" initiative, which is designed to showcase and teach 25 fundamental physical exam skills and their diagnostic benefits to interns.

Dr. Verghese earned his medical degree at the University of Madras, did his residency at East Tennessee State University College of Medicine, and completed his Fellowship in Infectious Diseases at Boston University School of Medicine. He later earned an MFA at the Iowa Writers Workshop during a two-year break from medicine.

Richard K. Parrish II, MD

AGS Lecturer

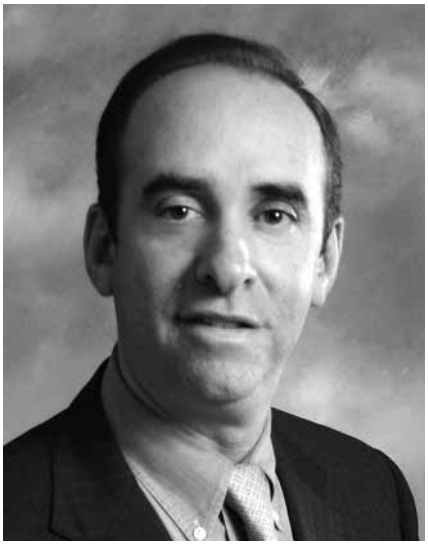
Richard K. Parrish II, MD, is Professor of Ophthalmology and Associate Dean for Graduate Medical Education at the University of Miami Miller School of Medicine in Florida. After receiving his medical degree from Indiana University School of Medicine, he completed an internship at The University of Alabama at Birmingham and his residency at Wills Eye Hospital in Philadelphia, Pennsylvania where he was chief resident. He performed clinical and research fellowships at the Bascom Palmer Eye Institute/Anne Bates Leach Eye Hospital at the University of Miami Miller School of Medicine.

Dr. Parrish served as a co-chairman of the Ocular Hypertension Treatment Study and was chairman of the Fluorouracil Filtering Surgery Study. He is an associate editor of the *American Journal of Ophthalmology,* and was editor of the *Ophthalmology Monograph Series* and was the 16th editor of the *Transactions of the American Ophthalmological Society.*

Dr. Parrish has published over 100 peer reviewed articles and has delivered 28 named lectures, including the 2009 Robert N. Schaffer Lecture at the American Academy of Ophthalmology. He received the Lifetime Achievement Award of the American Academy of Ophthalmology in 2009.

Dr. Parrish is a member of the American Ophthalmological Society, the American Academy of Ophthalmology, American Glaucoma Society and The Glaucoma Research Society.

Clinician-Scientist Lecturer



Jeffrey M. Liebmann, MD

Jeffrey M. Liebmann, MD graduated from Boston University School of Medicine in 1984, completed his ophthalmology residency at the State University of New York/ Downstate Medical Center in 1987 and his glaucoma fellowship at the New York Eye and Ear Infirmary. Dr. Liebmann is presently Clinical Professor of Ophthalmology at New York University School of Medicine and Director of Glaucoma Services at Manhattan Eye, Ear, and Throat Hospital and New York University Langone Medical Center and Adjunct Professor of Clinical Ophthalmology at New York Medical College, Valhalla, New York. He is a fellow of the American Academy of Ophthalmology, Association for Research in Vision and Ophthalmology, and American College of Surgeons. Dr. Liebmann currently is the immediate past-President of the American Glaucoma Society, Secretary-Treasurer of the New York Glaucoma Society and co-editor of *Journal of Glaucoma* and is a member of the Board of Governors of the World Glaucoma Association and Board of Directors of The Glaucoma Foundation. Dr. Liebmann has served as President of the New York Society for Clinical Ophthalmology and as member of the ARVO Glaucoma Section Planning Committee and is co-founder of the New York Glaucoma Research Institute, the American Glaucoma Society Foundation and ASCRS Glaucoma Day.

In addition to maintaining a busy tertiary-care referral practice in New York City, Dr. Liebmann is Principal Investigator of the African Descent and Glaucoma Evaluation Study at the New York Eye and Ear Infirmary and is the author and/or co-author of more than 950 medical and scientific papers, book chapters, and abstracts. He has lectured widely in the United States and abroad on glaucoma diagnosis and management. His current main areas of research interest include the causes of glaucoma, glaucoma progression, glaucoma surgery, ocular imaging, and neuroprotection.

Ivan Goldberg, AM, MB, BS (Syd), FRANZCO, FRACS

International Recognition Award

Ivan Goldberg, AM, MB, BS (Syd), FRANZCO, FRACS Member of the Order of Australia, is Head of the Glaucoma Unit, Sydney Eye Hospital, Clinical Associate Professor, University of Sydney and Director of Eye Associates.

Ivan is President of the Australian and New Zealand Glaucoma Interest Group and Glaucoma Australia as well as Past President of the World Glaucoma Association and the Royal Australian and New Zealand College of Ophthalmologists. He was Founding President of the South East Asia Glaucoma Interest Group and chaired both editions of the Asia Pacific Glaucoma Guidelines. Ivan hosted the World Ophthalmology Congress (2002) and the Asia Pacific Academy of Ophthalmology meeting (2011), both in Sydney.

Having trained in Ophthalmology in Sydney, Ivan was a Glaucoma Fellow and then on the faculty of Washington University, St Louis before returning home to Australia. He has maintained strong affiliations with many American colleagues who are among his closest professional and personal friends.

Ivan has co-authored over 125 peer-reviewed publications, over 20 editorials and over 20 books and book chapters. He is committed to patient care, development of professional associations and education and to advancing understanding.

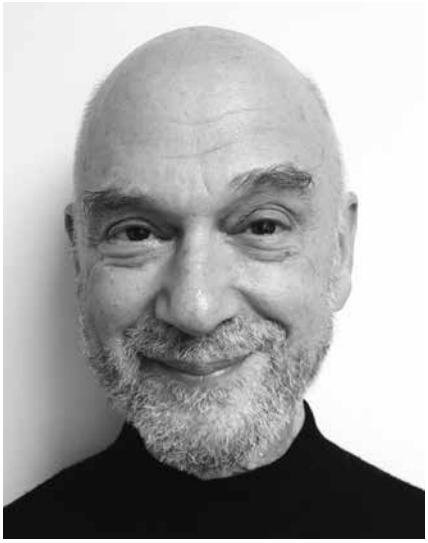
Innovator Award

Robert N. Weinreb, MD

Robert N. Weinreb, M.D., is the Distinguished Professor of Ophthalmology and Chairman of the Department of Ophthalmology at the University of California, San Diego. He also holds the Morris Gleich Chair and is Director of both the Shiley Eye Center and the Hamilton Glaucoma Center. Dr. Weinreb is a graduate of Harvard Medical School.

As a resident in ophthalmology, he dreamed about big advances that could change the care of glaucoma patients and the future of glaucoma, and then tried to create them. With collaborators at the Hamilton Glaucoma Center and throughout the world, Dr. Weinreb's innovative glaucoma research has ranged from the front to the back of the eye, from the eye to the brain, and from the laboratory to the clinic over more than three decades. With funding from the National Eye Institute since he was a resident, his research and insights have significantly impacted our understanding of the pathophysiology and biology of glaucoma, as well as its diagnosis and management. They have contributed to the development and translation into clinical practice of new technologies and testing paradigms such as confocal scanning laser ophthalmoscopy, scanning laser polarimetry, selective functional testing, risk assessment and 24 hour IOP measurement. His work has led to the development of cutting-edge tools for laboratory research such as trabecular meshwork and ciliary muscle cell culture, murine aqueous dynamics, and *in situ* retinal ganglion cell imaging. His research also has discovered underlying mechanisms of glaucoma disease processes such as the glaucomatous neurodegenerative changes within the central visual pathway, molecular mechanisms of retinal ganglion cell injury, prostaglandin action on uveoscleral outflow and transscleral drug delivery.

Dr. Weinreb has served as President of the Association for Research in Vision and Ophthalmology (ARVO), President of the World Glaucoma Association (WGA), and President of the American Glaucoma Society (AGS). He recently completed 22 years of service on the Executive Committee of the American Glaucoma Society during which he held several leadership positions. His enduring contributions to the AGS include the AGS-Net, the MAPS program and AGS Physician Scientist Grants, Advocacy Day in Washington DC, and the AGS online newsletter. He currently serves as President of the American Glaucoma Society Foundation (AGSF) and is President-Elect of the Pan American Glaucoma Society (PAGS). He also is the Chief Editor of the *International Glaucoma Review* and the Chair of the World Glaucoma Association Consensus Initiative. Author of more than 1400 publications (including 927 peer-reviewed manuscripts), he has been the recipient of numerous prizes and awards. Dr. Weinreb has trained more than 120 post-doctoral Fellows in Glaucoma, many of whom hold distinguished academic positions throughout the world.



Marc F. Lieberman, MD

Humanitarian Award

I was born and educated in Baltimore, in a family of physicians and rabbis, the middle of three brothers. I dropped out of high school, yet was accepted to Reed College at age 16; there I graduated as their first Department of Religion major, based on my studies in pre-Hebraic languages during a junior year abroad at the Hebrew University in Jerusalem. Returning to Israel for two more years, I switched to pre-med; but came back to the U.S. for further study. Miraculously, I was accepted at Johns Hopkins Medical School, where I stayed on for ophthalmic training at the Wilmer Eye Institute, after an intern year in Ann Arbor. My Glaucoma Fellowship was with Dr. Robert Shaffer and associates at UCSF.

Other than a 6-month stint as Chief Resident at Illinois Eye & Ear Infirmary in 1981, I have since remained in San Francisco. I've practiced in virtually every professional niche in the Bay Area: glaucoma specialist at Kaiser Permanente; full-time faculty member at Stanford University and California Pacific Medical Center (CPMC); glaucoma specialist in a large multi-specialty private practice; and finally, these past 15 years, in a glaucoma-only private practice, serving four metropolitan locations among our three partners. During this entire period I have been continuously involved in resident training: both as a Clinical Professor of Ophthalmology at UCSF, and Director of Glaucoma Services at the Department of Ophthalmology at CPMC.

My gratification in academic ophthalmology—expressed by my love of teaching, and less-loved writing of two dozen articles and two textbooks—has been balanced both by the pleasure of raising an extraordinary, socially conscious attorney-son, and by thirty years of intense involvement with spiritual life. The latter began with volunteer glaucoma teaching in Southern Indian eye centers from 1983-1985; three decades of intensive Buddhist meditation practice; temporary ordination as a Theravadin monk in the Burmese tradition; and co-founder of the first American Theravadin monastery/nunnery in California (Abhayagiri in Ukiah) for Western-born monastics. Seeking to integrate my deep love for both my Judaic heritage and Buddhist learning, I initiated the first meetings between His Holiness the Dalai Lama and leading Jewish scholars and rabbis at meetings in New York and later Dharamsala, India, in 1988-89, as documented in Rodger Kamenetz's best-selling *The Jew in the Lotus*.

These encounters seeded a profound commitment in me to apply my ophthalmic skills to the benefit of the Tibetan people directly. In 1995 I arranged my first visit to the largest hospital in Lhasa, Tibet, where I demonstrated and taught the first microscopic ECCE/IOL surgery to Tibetan doctors. Thus was founded the Tibet Vision Project for the dissemination of cataract skills and equipment for Tibetans to address the scourge of cataract blindness in their own country. With the help of volunteer colleagues, funding from a few generous donors, and affiliation with international NGO's (e.g., Swiss Red Cross), we have continuously worked 4-8 weeks/year in Tibet for the past 18 years. We have trained 80% of Tibet's eye surgeons, and sponsored over 5000 procedures. Currently, we are transitioning the Tibet Vision Project to formally serve as a 'foreign consultant' to the Zhongshan Ophthalmic Center in Guangzhou. This will facilitate seamless access between Tibetan and Chinese surgical institutions: to methodically develop Tibet's local capacities, with whatever help our guidance and support can provide during our annual visits.

New Members

Spring 2012

Active

Cindy Mary-Lynn Hutnik, MD, PhD, FRCSC

Peter Jonathan Joson, MD

Albert S. Khouri, MD

Charles M. Lederer, MD

Mary L. McHam, MD

Parna Shenoy, MD

Amy Wise Gemperli, MD
Jason Aidan Goldsmith, MD, MS
Paul L. Krawitz, MD
Kenneth S. Schwartz, MD

Associate

Karen T. Graham, MD
Robert F. Sanke, MD

International

Sami M. Alodhayb, MD
Saudi Arabia

Taher A. Ahmed, MD
Bahrain

Provisional

Scott D. Lawrence, MD

Keith J. Mathers, MD

James C. Tan, MD, PhD, FRCOphth

Scott J. Fudemberg, MD
Hussain Y. Patel, MD
Elyse R. Trastman-Caruso, MD
Wen-Jeng (Melissa) Yao, MD

Fall 2012

Active

Sheila Bazzaz, MD

Michael V. Boland, MD

Kathryn Bollinger, MD

Steven M. Brady, MD

Sunil Deokule, MD

Asra S. Firozvi, MD

Travis C. Frazier, MD

Lydia F. Lane, MD

Gisele Li, MD

Jane Loman, MD

Shayna J. A. Mangers, MD

Anand V. Mantravadi, MD

Robert E. Marquis, MD, PhD

Steven H. McKinley, MD

Johann G. Ohly, MD

Thomas D. Patrianakos, MD

Nathan M. Radcliffe, MD

Sunita Radhakrishnan, MD

Sushma Rai, MD

Micah W. Rothstein, MD

Ilya Rozenbaum, MD

Timothea A. Ryan, MD

Clinton W. Sheets, MD

Anurag Shrivastava, MD

Hector J. Villarrubia, MD

Sarah R. Wellik, MD

Joshua P. Zastrocky, MD

Joseph R. Zelefsky, MD

Amish B. Doshi, MD
Patricia S. Y. Ferrell, MD
Paul J. Mackenzie, MD, PhD, FRCSC
Abraham W. Suhr, MD
Scott G. Womack, MD
Karen A. Young, MD

Associate

James W. Harris, Jr, MD

Lawrence E. Kagemann, PhD

Oswald Rondon, MD

Reza Haque, MD, PhD

International

Zaher Sbeity, MD, FEBO
Germany

Michael Smith, MBCHB FRCOphth
England

Provisional

Harmohina Bagga, MD

Lauren S. Blieden, MD

Brenda L. Bohnsack, MD, PhD

Jessica L. Chen, MD

Sylvia H. Chen, MD CM, MBA, FRCSC

Tony T. Choi, MD

Yvonne I. Chu, MD

Ian P. Conner, MD, PhD

Syril K. Dorairaj, MD

Allison A. Dublin, MD

Matthew J. Fabrizio, MD

Amy Fang, MD

Omar S. Faridi, MD

Tatiana C. Franco, MD

Gretta Fridman, MD


Andrew P. Greenberg, MD


Ben J. Harvey, MD


Anthony T. Hsu, DO


Jennifer Huang, MD


Matthew S. Johnson, MD


Kevin Kaplowitz, MD


James Kim, MD, PhD


Max C. Kim, MD


Robert M. Kinast, MD


Tyler Q. Kirk, MD


Robert M. Knape, MD


Benjamin P. Kronberg, MD


Matthew D. Lazzara, MD


Amanda Y. Lehman, MD, MSc


Kaweh Mansouri, MD, MPH


Amy Z. Martino, MD


Joseph F. Panarelli, MD


Derrick C. Pau, MD


Usha Rao, MD


Leonard K. Seibold, MD

Amelia C. Sheh, MD

Nir Shoham Hazon, MD

Sandra Fernando Sieminski, MD

Justin R. Tannir, MD

Savak Teymoorian, MD, MBA

Melissa Tong, MD

Andrew Toren, MD, FRCSC

Valerie Trubnik, MD

Eric H. Wigton, MD

William D. Witt, MD

Erynn B. Yang, MD

Nanfei Zhang, MD

Shunai Jiang, MD, PhD
Varun Malhorta, MD
David S. Slade, MD
Geetha Vedula, MD

Fellow in Training 2012-2013

Melissa Ajunwa, MD

Michelle Butler, MD

Aiyin Chen, MD

Iryna A. Falkenstein, MD

Derrick S. Fung, MD

Rafael L. Furlanetto, MD

Wei Huang, MD

Jeremy K. Jones, MD

Hanna Kim, MD

Joseph T. Kim, MD

Helen Koenigsman, MD

Hamed B. Lari, MD

Christine L. Larsen, MD

Yao Liu, MD

John R. McManus, MD

Daniel B. Moore, MD

Richard G. Morshedi, MD

Stephanie Muylaert, MD

Camila Netto, MD

Donna Nguyen, MD

Pallavi Ojha, MD

Pat Michael Palmiero, MD

Lindsay A. Rhodes, MD

Joseph Schmitz, MD

My L. Shaw, MD

Brian J. Song, MD

Pitipong Suramethakul, MD

Elaine G. Thung, MD

Jonathan Tung, MD

Michael Waisbourd, MD

Charles H. Weber, MD

Mark N. Welch, DO

Joanne C. Wen, MD

Linda Zhang, MD

Elisa Bala, MD
Nancy M. Buchser, MD
Rachel E. Davis, MD
David Diaz, MD
Boris Dilman, MD
Matthew George, MD
Alex Huang, MD, PhD
Wendy A. Kirkland, MD
Michael S. Koval, MD
Mehul Nagarsheth, MD
Swathi C. Reddy, MD, MPH
Kristin L. Schmid, MD
Scott K. Schultz, MD
Shandiz Tehrani, MD, PhD
Brian John Tienor, MD
Zachary Vest, MD
Nadya Y. Villalba Ramos, MD
William D. Witt, MD

Program Schedule

WEDNESDAY, FEBRUARY 27

5:00 PM – 8:00 PM	Registration & Exhibitor Check-In	North Registration
5:00 PM – 8:00 PM	Exhibitor Installation	Salon 8

THURSDAY, FEBRUARY 28 – SURGERY DAY

6:00 AM – 6:30 PM	Registration & Exhibitor Check-In		North Registration
6:00 AM – 7:00 AM	Poster Set-up (1-41)		Left of South Registration, outside Salon 10
7:00 AM – 8:00 AM	Breakfast – Exhibit Hall		Salon 8
7:00 AM – 3:40 PM	Exhibit Hall Viewing		
7:00 AM – 5:00 PM	Poster Viewing (1-41)		Left of South Registration, outside Salon 10
8:30 AM – 10:30 AM	Spouse Guest Hospitality Room		Pacific Suite B
9:30 AM – 10:15 AM	Concierge Visit to Hospitality Room		
7:00 AM – 8:00 AM	Surgery Poster Session with Authors 1st Round (1-41) CME Brian C. Samuels, MD, PhD; Lisa F. Rosenberg, MD		Left of South Registration, outside Salon 10
8:00 AM – 8:02 AM	Welcome and Introduction AGS President – Kuldev Singh, MD, MPH Surgery Day Co-Chairs: Ronald L. Fellman, MD and Christopher A. Girkin, MD, MSPH		Salon 9
8:02 AM – 8:03 AM	Housekeeping Christopher A. Girkin, MD MSPH; Ronald L. Fellman, MD		
8:03 AM – 9:03 AM	**Surgery Day Section 1/Symposium 1** CME AGS/ASCR VIDEO SYMPOSIUM Good to Great: Improving Your Technique for Challenging Cases Malik Y. Kahook, MD; Douglas J. Rhee, MD		
	8:03 AM – 8:06 AM	Introduction: Malik Y. Kahook, MD; Douglas J. Rhee, MD	
	8:06 AM – 8:09 AM	#1) Case Presentation: Persistent Bleb Leak Status Post Blebitis in an Eye with an ExPress Device (Conjunctival Advancement vs. Conjunctival Advancement with Removal of ExPress) Malik Y. Kahook, MD; Douglas J. Rhee, MD	
	8:09 AM – 8:14 AM	Conjuctival Advancement Leon W. Herndon, Jr, MD	
	8:14 AM – 8:19 AM	Conjunctival Advancement with Removal of ExPress Leo K. Seibold, MD	
	8:19 AM – 8:25 AM	Judging Panel Comments	
	8:25 AM – 8:28 AM	#2) Case Presentation: Congenital Glaucoma with Slight Corneal Haze (Goniotomy vs. 360 Trabeculotomy) Malik Y. Kahook, MD; Douglas J. Rhee, MD	
	8:28 AM – 8:33 AM	Goniotomy Alana L. Grajewski, MD	
	8:33 AM – 8:38 AM	360 Trabeculotomy Robert M. Feldman, MD	
	8:38 AM – 8:44 AM	Judging Panel Comments	

	8:44 AM – 8:47 AM	#3) Case Presentation: Repeat Tube Erosion (Primary Repair vs. Tube Repositioning into the Pars Plana) Malik Y. Kahook, MD; Douglas J. Rhee, MD	
	8:47 AM – 8:52 AM	Primary Repair Barbara Smit, MD, PhD	
	8:52 AM – 8:57 AM	Tube Repositioning into the Pars Plana Jonathan Eisengart, MD	
	8:57 AM – 9:03 AM	Judging Panel Comments	
9:03 AM – 10:03 AM	**Surgery Day Section 2** CME		**Salon 9**
	GLAUCOMA PROCEDURES: BACK TO THE FUTURE Dana M. Blumberg, MD; Christopher A. Girkin, MD, MSPH		
	9:03 AM – 9:11 AM	The Evolution of Trabeculectomy Sayoko E. Moroi, MD, PhD	
	9:11 AM – 9:19 AM	The Evolution of Deep Scleral Procedures Richard A. Lewis, MD	
	9:19 AM – 9:27 AM	The Evolution of Angle Surgery Murray A. Johnstone, MD	
	9:27 AM – 9:35 AM	The Evolution of Drainage Implants Steven J. Gedde, MD	
	9:35 AM – 9:43 AM	The Evolution of Pediatric Glaucoma Procedures Allen D. Beck, MD	
	9:43 AM – 10:03 AM	Panel Discussion	
10:03 AM – 10:35 AM	*Break – Exhibit Hall*		Salon 8
10:35 AM – 11:35 AM	**Surgery Day Section 3**		**Salon 9**
	Paper Presentations 1-5 Ronald L. Fellman, MD; Anne L. Coleman, MD, PhD		
	10:35 AM – 10:42 AM	Prospective Randomized Study Comparing ExPRESS to Trabeculectomy: 1 Year Results Yvonne M. Buys, MD	
	10:42 AM – 10:47 AM	Discussion/Practical Applications	
	10:47 AM – 10:54 AM	Long Term Results from a Prospective, Multicenter Study of a Schlemm's Canal Microstent for IOP Reduction in Open Angle Glaucoma in Phakic and Pseudophakic Eyes. Manfred Tetz, MD	
	10:54 AM – 10:59 AM	Discussion/Practical Applications	
	10:59 AM – 11:06 AM	Safety and Clinical Effect of Suprachoroidal Micro-stent Implantation in Conjunction with Phacoemulsification Cataract Surgery in Open-angle Glaucoma Patients on One or Two Intraocular Pressure-lowering Medications Steven D. Vold, MD	
	11:06 AM – 11:11 AM	Discussion/Practical Applications	
	11:11 AM – 11:18 AM	IOP and Medication Reduction after Micro Invasive Glaucoma Surgery with Two Trabecular Micro-Bypass Stents in OAG L. Jay Katz, MD	
	11:18 AM – 11:23 AM	Discussion/Practical Applications	
	11:23 AM – 11:30 AM	Long-term Surgical Risks of Trabeculectomy in the Collaborative Initial Glaucoma Treatment Study Paul R. Lichter, MD	
	11:30 AM – 11:35 AM	Discussion/Practical Applications	
11:35 AM – 11:40 AM	**Presentation of Innovator Award to Robert N. Weinreb, MD**		
	Introduction: Neeru Gupta, MD, PhD, MBA		

11:40 AM – 12:13 PM	**GLAUCOMA SURGERY DAY LECTURE**		
	Glaucoma Surgery: Where We are Now and Where We are Going Marlene R. Moster, MD		
	11:40 AM – 11:43 AM	Introduction of Glaucoma Surgery Day Lecture: David S. Greenfield, MD	
	11:43 AM – 12:13 PM	Glaucoma Surgery Day Lecture: Marlene R. Moster, MD	
	12:13 PM – 12:15 PM	Announcements: Ronald L. Fellman, MD	
12:15 PM – 1:45 PM	*Lunch – On your own*		
1:45 PM – 2:25 PM	**Surgery Day Section 4** CME		**Salon 9**
	SURGICAL VIDEOS Steven L. Mansberger, MD; Steven D. Vold, MD		
2:25 PM – 3:25 PM	**Surgery Day Section 5**		
	ANGLE SURGERY IN ADULTS Nathan M. Radcliffe, MD; Christopher A. Girkin, MD, MSPH		
	2:25 PM – 2:33 PM	Review of the Medical Literature JoAnn A. Giaconi, MD	
	2:33 PM – 2:41 PM	Theory and Practice Davinder S. Grover, MD, MPH	
	2:41 PM – 2:49 PM	Goniosynechialysis in Angle Closure, Tips and Tricks Robert Ritch, MD	
	2:49 PM – 2:57 PM	Trabecular Bypass Procedures to Conventional Outflow Thomas W. Samuelson, MD	
	2:57 PM – 3:05 PM	Aqueous Shunting to the Suprachoroidal Space Celso Tello, MD	
	3:05 PM – 3:25 PM	Panel Discussion	
3:25 PM – 4:25 PM	**Surgery Day Section 6** CME		**Salon 9**
	PATHOPHYSIOLOGY AND OPERATIVE APPROACHES TO CHRONIC ANGLE CLOSURE GLAUCOMA Ronald L. Fellman, MD; Mildred M. G. Olivier, MD		
	3:25 PM – 3:33 PM	Chronic Angle Closure Glaucoma: Pearls for Differentiating Pupillary Block from Secondary Mechanisms Harry A. Quigley, MD	
	3:33 PM – 3:41 PM	Iridoplasty, Cataract Extraction and ECP for Plateau-Iris Syndrome Iqbal Ike K. Ahmed, MD	
	3:41 PM – 3:49 PM	Sulcus Placed Shunts: Tips and Tricks Jody R. Piltz-Seymour, MD	
	3:49 PM – 3:57 PM	Management of Angle Closure in Nanophthalmos Edward J. Rockwood, MD	
	3:57 PM – 4:05 PM	Detection, Differential and Management of Annular Choroidal Detachment Robert L. Stamper, MD	
	4:05 PM – 4:25 PM	Panel Discussion	
4:25 PM – 5:25 PM	**Surgery Day Section 7** CME		**Salon 9**
	FACING THE UNEXPECTED: MANAGING COMPLICATIONS WITH NEWER PROCEDURES Eydie G. Miller Ellis, MD; Ronald L. Fellman, MD		
	4:25 PM – 4:29 PM	Prevention and Management of a Rupture of Descemet's Window in Canaloplasty Brian E. Flowers, MD	
	4:29 PM – 4:33 PM	How to Perform a Laser Puncture of Descemet's Window after Canaloplasty Richard A. Lehrer, MD	

	4:33 PM – 4:37 PM	Managing Difficult Cannulation in Canaloplasty and 360 Trabeculotomy Alan S. Crandall, MD
	4:37 PM – 4:41 PM	Converting a Canaloplasty to an External Filtration Procedure Bradford J. Shingleton, MD
	4:41 PM – 4:45 PM	Removal of a Mini-Shunt Under a Scleral Flap Peter A. Netland, MD, PhD
	4:45 PM – 4:49 PM	Managing Blebitis with a Mini-Shunt Under a Scleral Flap Steven R. Sarkisian, Jr, MD
	4:49 PM – 4:53 PM	Prevention and Management of IOP Spikes Following Trabecular Meshwork Ablation Carla J. Siegfried, MD
	4:53 PM – 4:57 PM	Prevention and Management of Hyphema Following Trabecular Meshwork Ablation Arthur J. Sit, SM, MD
	4:57 PM – 5:01 PM	Complications and Management Following Trabecular Bypass Procedures Paul Harasymowycz, MD, FRCSC
	5:01 PM – 5:25 PM	Panel Discussion
5:00 PM – 5:45 PM	Poster Tear Down (1-41)	Left of South Registration, outside Salon 10
5:45 PM – 6:30 PM	Poster Set Up (42-74)	Left of South Registration, outside Salon 10
6:00 PM – 6:30 PM	Special Guest Lecture – Abraham Verghese, MD, MACP	Offsite, City View at Metreon
6:30 PM – 8:00 PM	Welcome Reception	Offsite, City View at Metreon

FRIDAY, MARCH 1

6:00 AM – 6:50 AM	Morning Yoga	Pacific Suite A
6:30 AM – 8:00 AM	Continental Breakfast – Exhibit Hall	Salon 8
7:00 AM – 6:00 PM	Registration	North Registration
7:00 AM – 4:30 PM	Exhibitor Viewing	Salon 8
7:00 AM – 5:00 PM	Poster Viewing (42-74)	Left of South Registration, outside Salon 10
8:30 AM – 10:30 AM	Spouse Guest Hospitality Room	Pacific Suite B
7:00 AM – 8:00 AM	Poster Session with Authors 2nd Round (42-74) CME Christopher Teng, MD; Thasarat S. Vajaranant, MD	Left of South Registration, outside Salon 10
8:00 AM – 8:05 AM	Announcements	Salon 9
8:05 AM – 9:05 AM	**Paper Presentations 6-10** CME Michele C. Lim, MD; Angelo P. Tanna, MD	
	8:05 AM – 8:12 AM	Comparing the Rate of Rim Area Change in Eyes with Visual Field and Optic Disc Endpoints: The Confocal Scanning Laser Ophthalmoscopy Ancillary Study to the Ocular Hypertension Treatment Study Linda M. Zangwill, PhD
	8:12 AM – 8:17 AM	Discussion/Practical Applications
	8:17 AM – 8:24 AM	The Ocular Hypertension Treatment Study: Difference in the Effect of Long Term IOP Variability on the Risk of Developing POAG Mae O. Gordon, PhD
	8:24 AM – 8:29 AM	Discussion/Practical Applications
	8:29 AM – 8:36 AM	Nerve Fiber Layer & Ganglion Cell Complex Measurements by OCT as Risk Factors for Visual Field Progression in Glaucoma Xinbo Zhang, PhD

	8:36 AM – 8:41 AM	Discussion/Practical Applications	
	8:41 AM – 8:48 AM	Treatment-to-Outcome Gap in Glaucomatous Eyes Undergoing Trabeculectomy Tracy M. Wright, MD	
	8:48 AM – 8:53 AM	Discussion/Practical Applications	
	8:53 AM – 9:00 AM	Large and Sustained Blood Pressure Dips Are Associated with Visual Field Progression in Normal-Tension Glaucoma Carlos G. De Moraes, MD	
	9:00 AM – 9:05 AM	Discussion/Practical Applications	
9:05 AM – 10:35 AM	**Symposium 2** CME		**Salon 9**
	WHAT'S NEW IN GLAUCOMA SCIENCE? Martin B Wax, MD; Robert N. Weinreb, MD		
	9:05 AM – 9:15 AM	Glaucoma Genetics Louis R. Pasquale, MD	
	9:15 AM – 9:20 AM	Panel Discussion	
	9:20 AM – 9:30 AM	Trabecular Meshwork Outflow Douglas J. Rhee, MD	
	9:30 AM – 9:35 AM	Panel Discussion	
	9:35 AM – 9:45 AM	Lymphatic Outflow Neeru Gupta, MD, PhD, MBA	
	9:45 AM – 9:50 AM	Panel Discussion	
	9:50 AM – 10:00 AM	Saving Retinal Ganglion Cells John Danias, MD, PhD	
	10:00 AM – 10:05 AM	Panel Discussion	
	10:05 AM – 10:15 AM	Neural Regeneration and Cell Therapies Jeffrey L. Goldberg, MD, PhD	
	10:15 AM – 10:20 AM	Panel Discussion	
	10:20 AM – 10:30 AM	Gene Therapy for Glaucoma Terete Borras, PhD	
	10:30 AM – 10:35 AM	Panel Discussion	
10:35 AM – 10:55 AM	*Break – Exhibit Hall*		Salon 8
10:55 AM – 12:25 PM	**Symposium 3** CME		**Salon 9**
	GLAUCOMA PRACTITIONER, ACADEMIC AND STATE AFFAIRS Jeffrey M. Liebmann, MD; Kuldev Singh, MD, MPH		
	10:55 AM – 11:05 AM	Business of Medicine William L. Rich III, MD	
	11:05 AM – 11:15 AM	Medical Politics David W. Parke, II, MD	
	11:15 AM – 11:25 AM	New Surgeries and Reimbursement Issues David F. Chang, MD	
	11:25 AM – 11:35 AM	New Coding Regulations and Impact Cynthia Mattox, MD	
	11:35 AM – 11:45 AM	Affordable Care Act and Implications for Health Disparity M. Roy Wilson, MD, MS	
	11:45 AM – 11:55 AM	Minding Practice Conflicts of Interest George L. Spaeth, MD	
	11:55 AM – 12:25 PM	Panel Discussion	
12:25 PM – 12:55 PM	AGS Annual Business Meeting		

12:55 PM – 1:10 PM	Group Photo		
1:10 PM – 2:40 PM	*Lunch – On your own*		
2:40 PM – 4:07 PM	**Symposium 4** CME		**Salon 9**
	ACHIEVING IOP TARGETS IN CLINICAL PRACTICE David S. Greenfield, MD; Kouros Nouri-Mahdavi, MD		
	2:40 PM – 2:45 PM	Target Intraocular Pressure (IOP): Origin and Current Concepts Paul F. Palmberg, MD, PhD	
	2:45 PM – 2:55 PM	Evidence Based Goals: Is There Any Proof that Setting Target Pressure Improves Outcomes in Glaucoma? David S. Friedman, MD, MPH, PhD	
	2:55 PM – 3:05 PM	Using Risk Calculators for Predicting Glaucoma Progression Carlos G. De Moraes, MD	
	3:05 PM – 3:15 PM	A Moving Target: How to Assess the Therapeutic Efficacy of Ocular Hypotensive Therapy Anthony D. Realini, MD	
	3:15 PM – 3:21 PM	How I Use Target IOP in Clinical Practice Robert D. Fechtner, MD	
	3:21 PM – 3:27 PM	Limitations of Target IOP Kuldev Singh, MD, MPH	
	3:27 PM – 3:37 PM	Integrating 24 Hour IOP Monitoring in Clinical Practice Arthur J. Sit, MS, MD	
	3:37 PM – 3:47 PM	Promising Techniques for Estimating Target IOP Claude F. Burgoyne, MD	
	3:47 PM – 4:07 PM	Panel Discussion	
4:07 PM – 4:27 PM	*Break – Exhibit Hall*		Salon 8
4:27 PM – 5:27 PM	**Paper Presentations 11-15** CME		**Salon 9**
	Christopher A. Girkin, MD, MSPH; Murray Fingeret, OD		
	4:27 PM – 4:34 PM	Deformation of the Non-Human Primate (NHP) Optic Nerve Head (ONH) Connective Tissues within 3-D Histomorphometric Reconstructions of Moderate and Severe Experimental Glaucoma (EG) Eyes. Ruojin Ren, MD	
	4:34 PM – 4:39 PM	Discussion/Practical Applications	
	4:39 PM – 4:46 PM	Reduced Schlemm's Canal Size in Glaucoma Observed by Spectral Domain OCT Larry Kagemann, MD	
	4:46 PM – 4:51 PM	Discussion/Practical Applications	
	4:51 PM – 4:58 PM	Identification and Classification of the Collector Channel System with in-vivo High Definition Anterior Segment OCT Alfredo R. Castillejos, MD	
	4:58 PM – 5:03 PM	Discussion/Practical Applications	
	5:03 PM – 5:10 PM	Retinal Blood Flow in Glaucomatous Eyes with Single Hemifield Damage Mitra Sehi, PhD	
	5:10 PM – 5:15 PM	Discussion/Practical Applications	
	5:15 PM – 5:22 PM	Measurement of Optic Nerve Head Blood Flow in Glaucoma by OCT Angiography David Huang, MD, PhD	
	5:22 PM – 5:27 PM	Discussion/Practical Applications	

5:27 PM – 6:00 PM	**23RD ANNUAL AGS LECTURE** CME What Can We Do With What We Know? – Improving Glaucoma Care in the Haitian American Community in South Florida Richard K. Parrish, II, MD Introduction: Kuldev Singh, MD, MPH	**Salon 9**
5:00 PM – 5:30 PM	Poster Tear-Down (42-74)	Left of South Registration, outside Salon 10
5:30 PM – 6:00 PM	Poster Set-Up (75-114)	Left of South Registration, outside Salon 10
7:00 PM – 8:00 PM	Gala Reception	Yerba Buena Grand Assembly
8:00 PM – 10:00 PM	Gala Banquet and Dinner	Salon 9

SATURDAY, MARCH 2

6:00 AM – 6:50 AM	Group Run	Hotel Front Entrance
7:00 AM – 8:15 AM	Breakfast – Exhibit Hall	Salon 8
7:00 AM – 4:00 PM	Registration	North Registration
7:00 AM – 11:00 AM	Exhibit Viewing	Salon 8
7:00 AM – 03:30 PM	Poster Viewing (75-114)	Left of South Registration, outside Salon 10
8:30 AM – 10:30 AM	Spouse Guest Hospitality Room	Pacific Suite B
7:00 AM – 8:00 AM	Poster Session with Authors – 3rd Round (75-114) CME Karim F. Damji, MD and Pradeep Y. Ramulu, MD, PhD	Left of South Registration, outside Salon 10
8:00 AM – 8:05 AM	*Announcements*	Salon 9
8:05 AM – 9:05 AM	**Paper Presentations 16-20** CME Janet B. Serle, MD; George A. Cioffi, MD	
	8:05 AM – 8:12 AM: A Prospective Randomized, Multicenter, Single-masked, Parallel, Dose Ranging (VOYAGER) Study to Compare the Safety and Efficacy of BOL-303259-X to Latanoprost in Subjects with Open Angle Glaucoma or Ocular Hypertension Robert N. Weinreb, MD	
	8:12 AM – 8:17 AM: Discussion/Practical Applications	
	8:17 AM – 8:24 AM: The Cost of Glaucoma Care Provided to a Sample of Medicare Beneficiaries from 2002--2009 Harry A. Quigley, MD	
	8:24 AM – 8:29 AM: Discussion/Practical Applications	
	8:29 AM – 8:36 AM: Evaluating IOP Reduction Resulting from Sustained Delivery Via Travoprost-Eluting Hydrogel Punctum Plugs Shamira A. Perera, MD	
	8:36 AM – 8:41 AM: Discussion/Practical Applications	
	8:41 AM – 8:48 AM: A Comparison of Trabeculectomy Surgery Outcomes with Mitomycin-C Applied by Intra-Tenon Injection versus Sponge Method Michele C. Lim, MD	
	8:48 AM – 8:53 AM: Discussion/Practical Applications	
	8:53 AM – 9:00 AM: Using Filtered Forecasting Techniques to Determine Personalized Monitoring Schedules for Patients with Open Angle Glaucoma Joshua D. Stein, MD, MS	
	9:00 AM – 9:05 AM: Discussion/Practical Applications	

9:05 AM – 10:50 AM	Symposium 5 CME		Salon 9
	UPDATE ON MANAGING INFLAMMATORY GLAUCOMAS Joseph A. Caprioli, MD; Dale K. Heuer, MD		
	9:05 AM – 9:15 AM	Glaucoma in Juvenile Immune Arthritis (JRA): New Information on Disease Course Gary N. Holland, MD	
	9:15 AM – 9:20 AM	Panel Discussion	
	9:20 AM – 9:30 AM	Glaucoma in JRA : Special Treatment Considerations Joseph A. Caprioli, MD	
	9:30 AM – 9:35 AM	Panel Discussion	
	9:35 AM – 9:45 AM	Glaucomatocyclitic Crisis: What's New? Ralph D. Levinson, MD	
	9:45 AM – 9:50 AM	Panel Discussion	
	9:50 AM – 10:05 AM	Glaucoma in Fuchs' Heterochromic Iridocyclitis: The State of the Art Michael A. Kapamajian, MD	
	10:05 AM – 10:10 AM	Panel Discussion	
	10:10 AM – 10:25 AM	Treatment Update – Open-Angle Glaucoma Associated with Uveitis Scott D. Smith, MD, MPH	
	10:25 AM – 10:30 AM	Panel Discussion	
	10:30 AM – 10:45 AM	Treatment Update – Angle-Closure Glaucoma Associated with Uveitis Keith Barton, MD, FRCP, FRCS	
	10:45 AM – 10:50 AM	Panel Discussion	
10:50 AM – 11:10 AM	*Break – Exhibit Hall*		Salon 8
11:10 AM – 12:10 PM	**Paper Presentations 21-25** CME		**Salon 9**
	Shan C. Lin, MD; Neeru Gupta, MD, PhD, MBA		
	11:10 AM – 11:17 AM	Episcleral Venous Pressure in Untreated Open Angle Glaucoma Nitika Arora, MBBS	
	11:17 AM – 11:22 AM	Discussion/Practical Applications	
	11:22 AM – 11:29 AM	Association between Myopia and Glaucoma in a United States Population Mary Qiu, BS	
	11:29 AM – 11:34 AM	Discussion/Practical Applications	
	11:34 AM – 11:41 AM	Continuous 24-h Intraocular Pressure Patterns in Untreated Glaucoma Patients Undergoing a Water Drinking Test Kaweh Mansouri, MD, MPH, FEBO	
	11:41 AM – 11:46 AM	Discussion/Practical Applications	
	11:46 AM – 11:53 AM	Changes in Ocular Biometric Parameters Over a 24 Hour Period in Ocular Hypertensive Patients Carol B. Toris, PhD	
	11:53 AM – 11:58 AM	Discussion/Practical Applications	
	11:58 AM – 12:05 PM	A Nested Case Control Study of Plasma ICAM-1, E-selectin and TNF Receptor 2 Levels and Incident Primary Open-angle Glaucoma Louis R. Pasquale, MD	
	12:05 PM – 12:10 PM	Discussion/Practical Applications	
12:10 PM – 12:50 PM	**CLINICIAN-SCIENTIST LECTURE** CME		**Salon 13-15**
	The Central Ten Degrees Jeffrey M. Liebmann, MD Introduction: Neeru Gupta, MD, PhD, MBA		
12:50 PM – 2:30 PM	*Lunch – On your own*		

2:30 PM – 4:00 PM	**Special Interest Group** CME	**Salon 9**
	THE EHR: SPECIAL NEEDS FOR GLAUCOMA Nathan M. Radcliffe, MD; James D. Brandt, MD; Steven L. Mansberger, MD, MPH; Michele C. Lim, MD; John C. Burchfield, MD; Jonathan S. Myers, MD	
11:15 AM – 4:00 PM	Exhibitor Tear-Down	Salon 8
3:30 PM – 4:00 PM	Poster Tear-Down (75-114)	Left of South Registration, outside Salon 10

SUNDAY, MARCH 3

7:00 AM – 11:00 AM	Registration	North Registration
7:00 AM – 8:00 AM	**Breakfast Roundtable Discussions** CME	**Salon 9**
	Trabeculectomy Re-Visited: Modern Tweaks to Reduce Complications Simon K. Law, MD; Sushma Rai, MD	
	Minimally Invasive Glaucoma Surgery (MIGS) for My Patients? Steve D. Vold, MD; Andy C.S. Crichton, MD, FRCS	
	What To Do When a Tube is Not Enough Donald L. Budenz, MD, MPH; Steven J. Gedde, MD	
	Managing Glaucoma During Pregnancy L. Jay Katz, MD; Carla J. Siegfried, MD	
	Slit Lamp Procedures 101 Todd W. Perkins, MD; Jeffrey Zink, MD	
	Recognition and Treatment of Malignant Glaucoma Harry A. Quigley, MD; Molly M. Walsh, MD	
	Management of Hypotony in Glaucoma Sarwat Salim, MD	
8:00 AM – 11:00 AM	**Workshops** CME	
	Superbowl of Grand Rounds Jody R. Piltz-Seymour, MD; Dale K. Heuer, MD	Salon 10-12
	Coding, PQRS/E-Prescribing and Transitioning to ICD-10-CM Sue Vicchrilli, COT, OCS; Ronald L. Fellman, MD; Cynthia Mattox, MD	Salon 13-15

Glaucoma Surgery Day

Thursday, February 28

Co-Chairs: Ronald L. Fellman, MD and Christopher A. Girkin, MD, MSPH; Introduction: Kuldev Singh, MD, MPH

Surgery Day Section 1/ Symposium 1 ASCRS: Good to Great: Improving Your Technique for Challenging Cases

Moderator
Malik Y. Kahook, MD

Moderator
Douglas J. Rhee, MD

Summary

This session will involve a lively discussion of surgical options for specific clinical/surgical scenarios. Emphasis is placed on showing surgical techniques using video and other AV methods. We will discuss cases involving infection after filtration surgery, pediatric glaucoma procedures and management of tube erosion after glaucoma drainage device implantation. The attendees will be able to take pearls for practice back to the operating room and help expand options for patient care. This session targets physicians at various stages of practice who care for glaucoma patients.

CASE #1: CASE PRESENTATION: PERSISTENT BLEB LEAK STATUS POST BLEBITIS IN AN EYE WITH AN EXPRESS DEVICE

Conjuctival Advancement
Leon W. Herndon, Jr, MD

Conjunctival Advancement with Removal of ExPress
Leo K. Seibold, MD

CASE #2: CASE PRESENTATION: CONGENITAL GLAUCOMA WITH SLIGHT CORNEAL HAZE

Goniotomy
Alana L. Grajewski, MD

360 Trabeculotomy
Robert M. Feldman, MD

CASE #3: CASE PRESENTATION: REPEAT TUBE EROSION

Primary Repair
Barbara Smit, MD

Tube Repositioning into the Pars Plana
Jonathan Eisengart, MD

Surgery Day Section 2 – Glaucoma Procedures: Back to the Future

Moderator
Dana M. Blumberg, MD

Moderator
Christopher A. Girkin, MD, MSPH

Summary

This course will describe techniques for successful performance of glaucoma surgical procedures. We will discuss avoiding and managing potential complications and we will review the early detection, prevention, and specific management strategy of the common complications that may be associated with glaucoma surgery.

The Evolution of Trabeculectomy
Sayoko E. Moroi, MD, PhD

The Evolution of Deep Scleral Procedures
Richard A. Lewis, MD

The Evolution of Angle Surgery
Murray A. Johnstone, MD

The Evolution of Drainage Implants
Steven J. Gedde, MD

The Evolution of Pediatric Glaucoma Procedures
Allen D. Beck, MD

Surgery Day Section 3 – Paper Presentations 1-5

Moderator
Ronald L. Fellman, MD

Moderator
Anne L. Coleman, MD, PhD

Prospective Randomized Study Comparing ExPRESS to Trabeculectomy: 1 Year Results
Yvonne M. Buys, MD

Long Term Results from a Prospective, Multicenter Study of a Schlemm's Canal Microstent for IOP Reduction in Open Angle Glaucoma in Phakic and Pseudophakic Eyes.
Manfred Tetz, MD

Safety and Clinical Effect of Suprachoroidal Micro-stent Implantation in Conjunction with Phacoemulsification Cataract Surgery in Open-angle Glaucoma Patients on One or Two Intraocular Pressure-lowering Medications
Steven D. Vold, MD

IOP and Medication Reduction after Micro Invasive Glaucoma Surgery with Two Trabecular Micro-Bypass Stents in OAG
L.Jay Katz, MD

Long-term Surgical Risks of Trabeculectomy in the Collaborative Initial Glaucoma Treatment Study
Paul R. Lichter, MD

Surgery Day Section 4 – Surgical Videos

Moderator
Steven L. Mansberger, MD, MPH

Moderator
Steven D. Vold, MD

Summary

Glaucoma surgical techniques are rapidly evolving. This forum will allow surgeons to share insight, tips and tricks they use to enhance surgical outcomes.

Surgery Day Section 5 – Angle Surgery in Adults

Moderator
Nathan M. Radcliffe, MD

Moderator
Christopher A. Girkin, MD, MSPH

Summary

This symposium will highlight a variety of approaches towards angle surgery in adults with glaucoma. Speakers will present the

best evidence, theoretical rationales and practical approaches for the employment of adult angle-based surgical techniques. Platform speakers will present clinical data, surgical images and videos and will address appropriate patient selection and how to best balance safety and IOP lowering efficacy with angle surgery. There will be opportunity for audience questions/comments and for panel discussion.

Review of the Medical Literature
JoAnn A. Giaconi, MD

Theory and Practice
Davinder S. Grover, MD, MPH

Goniosynechialysis in Angle Closure, Tips and Tricks
Robert Ritch, MD

Trabecular Bypass Procedures to Conventional Outflow
Thomas W. Samuelson, MD

Aqueous Shunting to the Suprachoroidal Space
Celso Tello, MD

Surgery Day Section 6 – Pathophysiology and Operative Approaches to Chronic Angle Closure Glaucoma

Moderator
Ronald L. Fellman, MD

Moderator
Mildred G. Olivier, MD

Summary

This session is designed to help physicians understand the pathophysiologic mechanisms that cause the various types of chronic angle closure glaucoma including pupillary block, aqueous misdirection, plateau iris, nanophthalmos and secondary angle closure.

Chronic Angle Closure Glaucoma: Pearls for Differentiating Pupillary Block from Secondary Mechanisms
Harry A. Quigley, MD

Iridoplasty, Cataract Extraction and ECP for Plateau-Iris Syndrome
Iqbal Ike K. Ahmed, MD

Sulcus Placed Shunts: Tips and Tricks
Jody R. Piltz-Seymour, MD

Management of Angle Closure in Nanophthalmos
Edward J. Rockwood, MD

Detection, Differential and Management of Annular Choroidal Detachment
Robert L. Stamper, MD

Surgery Day Section 7 – Facing the Unexpected: Managing Complications with Newer Procedures

Moderator
Eydie D. Miller Ellis, MD

Moderator
Ronald L. Fellman, MD

Summary

It is essential for the glaucoma specialist to be on the cutting edge of what's available to benefit our patients. However, there are inherent risks with any new procedure due to limited familiarity of the surgeon with the device. In this session, surgeons who are experienced with these new procedures will discuss the surgical steps, focusing on those which provided the greatest challenge, and discuss how to manage the complications.

Prevention and Management of a Rupture of Descemet's Window in Canaloplasty
Brian E. Flowers, MD

How to Perform a Laser Puncture of Descemet's Window after Canaloplasty

Richard A. Lehrer, MD

Managing Difficult Cannulation in Canalplasty and 360 Trabeculotomy

Alan S. Crandall, MD

Converting a Canaloplasty to an External Filtration Procedure

Bradford J. Shingleton, MD

Removal of a Mini-Shunt under a Scleral Flap

Peter A. Netland, MD, PhD

Managing Blebitis with a Mini-Shunt under a Scleral Flap

Steven R. Sarkisian, Jr, MD

Prevention and Management of IOP Spikes Following Trabecular Meshwork Ablation

Carla J. Siegfried, MD

Prevention and Management of Hyphema Following Trabecular Meshwork Ablation

Arthur J. Sit, SM, MD

Complications and Management Following Trabecular Bypass Procedures

Paul Harasymowycz, MD, FRCSC

Symposia

Friday, March 1

Symposium 2 – What's New in Glaucoma Science?

Moderator
Martin B Wax, MD

Moderator
Robert N. Weinreb, MD

Summary

This symposium will present information regarding emerging new scientific ideas in glaucoma. Participants will gain knowledge regarding progress in the field, with the opportunity to critically evaluate advances in glaucoma science and their relationship to glaucoma care to make both work better for the users.

Glaucoma Genetics
Louis R. Pasquale, MD

Trabecular Meshwork Outflow
Douglas J. Rhee, MD

Lymphatic Outflow
Neeru Gupta, MD, PhD, MBA

Saving Retinal Ganglion Cells
John Danias, MD, PhD

Neural Regeneration and Cell Therapies
Jeffrey L. Goldberg, MD, PhD

Gene Therapy for Glaucoma
Terete Borras, PhD

Symposium 3 – Glaucoma Practitioner, Academic and State Affairs

Moderator
Jeffrey M. Liebmann, MD

Moderator
Kuldev Singh, MD, MPH

Summary

This session will focus on contemporary topics important to the practicing glaucoma specialist including the business of medicine which includes issues pertaining to medical politics and reimbursement. The recently introduced changes in coding for glaucoma practice will be covered. The session will also address issues pertaining to disparities in the delivery of glaucoma care and managing conflicts of interest that present in current day glaucoma practice.

Business of Medicine
William L. Rich III, MD

Medical Politics
David W. Parke, II, MD

New Surgeries and Reimbursement Issues
David F. Chang, MD

New Coding Regulations and Impact
Cynthia Mattox, MD

Affordable Care Act and Implications for Health Disparity
M. Roy Wilson, MD, MS

Minding Practice Conflicts of Interest
George L. Spaeth, MD

Symposium 4 – Achieving IOP Targets in Clinical Practice

Moderator
David S. Greenfield, MD

Moderator
Kouros Nouri-Mahdavi, MD

Summary

This session will review the origin, current concepts, and evidence to support the calculation, recording and implementation of target intraocular pressure in clinical practice. Discussion will include using risk calculators for predicting glaucoma progression, the strengths and limitations of the monocular therapeutic trial, integrating 24-hour IOP monitoring, and promising techniques for estimating target IOP.

Target Intraocular Pressure (IOP): Origin and Current Concepts
Paul F. Palmberg, MD, PhD

Evidence Based Goals: Is There Any Proof that Setting Target Pressure Improves Outcomes in Glaucoma?
David S. Friedman, MD, MPH, PhD

Using Risk Calculators for Predicting Glaucoma Progression
Carlos G. De Moraes, MD

A Moving Target: How to Assess the Therapeutic Efficacy of Ocular Hypotensive Therapy
Anthony D. Realini, MD

How I Use Target IOP in Clinical Practice
Robert D. Fechtner, MD

Limitations of Target IOP
Kuldev Singh, MD, MPH

Integrating 24 Hour IOP Monitoring in Clinical Practice
Arthur J. Sit, MS, MD

Promising Techniques for Estimating Target IOP
Claude F. Burgoyne, MD

Saturday, March 2

Symposium 5 – Update on Managing Inflammatory Glaucomas

Moderator
Joseph A. Caprioli

Moderator
Dale K. Heuer, MD

Summary

This symposium is designed to explore the complex relationship between various forms of uveitis and glaucoma. The diagnosis, and medical and surgical treatments of this group of difficult diseases will be reviewed. An extensive review of the causes, diagnosis, and treatment of juvenile immune arthritis (formerly known as JRA), will be conducted. Other of the more common and important causes of inflammatory glaucomas are considered, including glaucomatocyclitic crisis and heterochromic iridocyclitis. The contemporary medical and surgical treatment of both open-angle glaucoma and angle-closure glaucoma associated with uveitis will be reviewed and discussed.

Glaucoma in Juvenile Immune Arthritis (JRA): New Information on Disease Course
Gary N. Holland, MD

Glaucoma in JRA: Special Treatment Considerations

Joseph A. Caprioli, MD

Glaucomatocyclitic Crisis: What's New?

Ralph D. Levinson, MD

Glaucoma in Fuchs' Heterochromic Iridocyclitis: The State of the Art

Michael A. Kapamajian, MD

Treatment Update – Open-Angle Glaucoma Associated with Uveitis

Scott D. Smith, MD, MPH

Treatment Update – Angle-Closure Glaucoma Associated with Uveitis

Keith Barton, MD, FRCP, FRCS

Paper Abstracts

Surgery

1. Prospective Randomized Study Comparing ExPRESS to Trabeculectomy: 1 Year Results

YVONNE M. BUYS, Lilach Drori Wagschal, Ya-Ping Jin, Delan Jinapriya, Graham E. Trope.

University of Toronto, Toronto, ON, Canada, Shaare Zedek Medical Center, Jerusalem, Israel, Queen's University, Kingston, ON, Canada

Purpose: To compare the efficacy and safety of the ExPRESS shunt to standard trabeculectomy.

Methods: Consenting patients with open-angle glaucoma scheduled for filtration surgery were prospectively randomized to trabeculectomy or ExPRESS both with MMC. Exclusion criteria included any previous ocular incisional surgery with the exception of clear cornea phaco or one previous trab, uveitis and vitreous in the anterior chamber. The main outcome was IOP. Secondary outcomes included visual acuity (VA), number of glaucoma medications, complications, corneal pachymetry (CCT), endothelial cell counts (ECC), bleb morphology and additional procedures. Standardized data collection sheets were completed at baseline and day 1, weeks 1 & 2 and months 1, 2, 3, 6 and 12 post-op. A sample size calculation determined that 52 eyes were required to detect a 2 mmHg difference with a power of 80%.

Results: 61 of 64 enrolled patients completed 1-year follow-up (31 ExPRESS and 30 Trab). There were no differences in baseline characteristics. The mean baseline IOP decreased from 22.6±10.2 and 22.0±6.8 to 11.0±5.5 and 10.0±4.5 at 1-yr in the ExPRESS and Trab groups respectively ($p<0.0001$). There was no significant difference in IOP between ExPRESS and Trab groups at any time point. Complete success (IOP 5-18 and 20% reduction from baseline without medication) was obtained in 71% ExPRESS and 57% Trab ($p=0.24$) and qualified success (± meds) in 87% ExPRESS and 93% Trab ($p=0.67$). 8 (26%) of the ExPRESS and 10 (33%) of the Trab patients were using glaucoma medications at 1-yr ($p=0.58$). Of the secondary outcomes the only significant difference was visual recovery which was faster in the ExPRESS group.

Discussion: There are 2 previously published RCTs comparing ExPRESS to Trab[1-3]. De Jong's study of 80 eyes reported better IOP control at one year[1], however after 3 years there was no longer a difference between the groups.[2] Dahan randomized fellow eyes of 15 patients and after a mean follow-up of 23.6 months found no difference in IOP but reported better success with ExPRESS.[3] Both studies found no statistically significant difference in glaucoma medications or complications.

Conclusions: At 1-year we found no statistically significant difference between ExPRESS and Trab groups regarding IOP, success rates, number of glaucoma medications, final VA, CCT, ECC, bleb morphology, complications and additional procedures. However, postoperative VA recovery was faster in the ExPRESS group.

References:

1. de Jong LAMS. Adv Ther 2009;26:336-35.
2. de Jong L et al. Clin Ophthalmol 2011;5:527-33.
3. Dahan E et al. Eye 2012;26:703-**10.**

2. Long Term Results from a Prospective, Multicenter Study of a Schlemm's Canal Microstent for IOP Reduction in Open Angle Glaucoma in Phakic and Pseudophakic Eyes

MANFRED TETZ, Katrin Lorenz, Thomas Samuelson, Norbert Pfeiffer, Marina Ramirez-Alfaro, Kuldev Singh.

University of Mainz, Mainz, Germany, Minneapolis Eye Consultants, Minneapolis, MN, ATK Spreebogen Augenklinik, Berlin, Germany, Codet Vision Institute, Tijuana, Mexico, Stanford University, Palo Alto, CA

Purpose: To evaluate the safety and effectiveness of a new implantable device for the treatment of mild to moderate open angle glaucoma.

Methods: This is a prospective, multicenter, single arm clinical evaluation of a Schlemm's canal microstent (Hydrus™, Ivantis Inc., Irvine, CA) in phakic and pseudophakic eyes with mild to moderate open angle glaucoma. Major inclusion criteria were washed out IOP between 21 and 32 mmHg, a glaucomatous disc, and mean deviation (MD) no worse than -12 dB on automated perimetry. The study device was placed into Schlemm's canal via an *ab interno* approach under gonioscopic guidance. Follow up visits were on days 1 and 7 as well as1, 3, 6, 12, and 18 months postoperatively. Study eyes were assessed regarding IOP, medication usage, and changes in visual status on all follow up visits.

Results: Forty eyes from 40 patients were recruited into the study. Mean (±s.d.) age was 65.5±10.8 years and MD on perimetry was -3.8 ± 5.2 dB. Baseline mean IOP was 21.6 ± 4.11 mmHg on 1.7 ± 1.4 glaucoma medications. There were no serious operative or postoperative complications. At 1, 3, 6, and 12 months follow up, IOP (N) was 19.2 ± 6.4 (40), 16.8 ± 4.1(40), 16.8 ± 4.0 (38), and 17.9±5.1 (37) mmHg on a mean of 0.3 ± 0.8, 0.6 ± 1.0, 0.7 ± 1.1, and 0.2±0.6 glaucoma medications, respectively. Further follow up at 18 months (N= 33/40 patients) showed that mean IOP remained at 17.8±0.3 mmHg with 0.4 mean medications per patient.

Discussion: Hydrus microstent implantation is associated with both IOP and medication reduction in the first postoperative year. At 18 months, with over 80% of patients completing 18 month follow up, the treatment effect is consistent with findings from 1-12 months.

Conclusions: A permanent implant that provides continuous, durable IOP control could offer an alternative to hypotensive medications for glaucoma patients. Long-term follow up suggests the treatment is safe and the effect is durable for 18 months.

3. Safety and Clinical Effect of Suprachoroidal Micro-stent Implantation in Conjunction with Phacoemulsification Cataract Surgery in Open-angle Glaucoma Patients on One or Two Intraocular Pressure-lowering Medications

STEVEN VOLD, Helmut Hoeh, E. Randy Craven, Quang H. Nguyen, Minas T. Coroneo, Tsontcho Ianchulev.

Vold Vision, PLLC, Fayetteville, AR, Eye Hospital at the Klinikum, Neubrandenburg, Germany, Rocky Vista University, Parker, CO, Scripps Clinic, La Jolla, CA, University New South Wales, Sydney, Australia, UC San Francisco, San Francisco, CA

Purpose: This study is designed to determine the safety and clinical effect of the suprachoroidal CyPass Micro-Stent (Transcend Medical, Inc. Menlo Park, CA) implanted in conjunction with cataract surgery in patients with open-angle glaucoma (OAG).

Methods: Subjects on 1 or 2 intraocular pressure (IOP)-lowering medications underwent standard phacoemulsification cataract surgery. After the completion of IOL implantation, a suprachoroidal micro-stent was inserted through the phaco incision and implanted into the supraciliary space under gonioscopic guidance. Inclusion criteria were Schaeffer grade 3 or 4 open-angle glaucoma being treated with 1 or 2 IOP-lowering medications, medicated IOP less than 33 mmHg and operable cataract in the study eye. Subjects were followed for up to 12 months. There were two cohorts, cohort 1 (uncontrolled IOP with baseline IOP ≥ 21 mmHg) and cohort 2 (controlled IOP with baseline IOP < 21 mmHg). outcome measures included adverse events, complications, IOP, and use of IOP-lowering medications.

Results: 145 patients were enrolled and successfully implanted with the micro-stent after uneventful phaco cataract surgery. No major adverse events such as choroidal hemorrhage, hypotony maculopathy or endophthalmitis were reported. The most common complication was transient hypotony (11%) with all cases resolved within 1 month postoperative. Mean IOP at baseline for cohort 1 (n=51) was 25.9 ± 5.5 mmHg. To date, 22 patients have reached the 12 month visit with a mean IOP of 15.7 ± 2.6 mmHg. Mean baseline medication use for cohort 1 was 1.6 ± 0.5 and the mean medications used for the 12 month patients was 0.9 ± 0.9. For cohort 2 (n=94), mean baseline medications was 1.5 ± 0.5 To date, 43 patients have reached the 12 month visit with mean medications of 0.6 ± 0.8 and continued maintenance of IOP control.

Discussion: In patients on 1 and 2 medications with uncontrolled IOP, suprachoroidal micro-stent implantation in conjunction with cataract surgery can safely reduce both IOP and medication use. In patients with controlled IOP on 1 and 2 medications, combined intervention can reduce topical medication use.

Conclusions: The suprachoroidal CyPass Micro-Stent provides a useful addition to the surgical armentarium for the reduction of IOP in patients with OAG.

4. IOP and Medication Reduction After Micro Invasive Glaucoma Surgery with Two Trabecular Micro-Bypass Stents in OAG

L. J. KATZ, Jonathan S. Myers.

Wills Eye Institute, Philadelphia, PA

Purpose: Safe and effective outcomes through two years postoperative have been shown following implantation of a single trabecular micro-bypass stent during cataract surgery in subjects with OAG and cataract. [1],[2],[3] This prospective study by the micro-invasive glaucoma surgery (MIGS) study group evaluated IOP reduction and safety of two stents in phakic or pseudophakic subjects with OAG not controlled on one ocular hypotensive medication.

Methods: Enrollment criteria included OAG not controlled on one medication, CD ratio ≤ 0.9, medicated IOP >18 to ≤ 30 mmHg, and IOP following medication washout ≥ 22 to ≤ 38 mmHg in either phakic or pseudophakic eyes. Forty qualified subjects were implanted with two stents (Glaukos) through a 1-mm clear corneal incision. Ocular hypotensive medication was prescribed if IOP exceeded 21 mmHg. Efficacy assessments were one-year unmedicated IOP reduction ≥ 20%, unmedicated IOP ≤ 18 mmHg, and mean change in IOP. Safety assessment included fundus exam/optic nerve evaluation, slit-lamp findings, BCVA, and complications/adverse events through two years.

Results: Mean preoperative medicated IOP was 20.7 mmHg (SD 2.1), and unmedicated (baseline) IOP was 24.2 mmHg (SD 1.5). Twenty-eight subjects have been followed through one year. IOP decreased to 14.0 mmHg (SD 3.3) at 1 month, 13.8 mmHg (SD 3.2) at 3 months, 13.4 mmHg (SD 1.5) at 6 months and 13.6 (SD 2.0) at 12 months. At 12 months, 25 of 28 subjects were on no medications, two subjects were on one medication each, and one subject was on two medications. A small hyphema in one subject at one week resolved by one month.

Discussion: Implantation of two stents resulted in significant reduction of IOP and medication burden through 12 months and a favorable safety profile.

Conclusions: Phakic/pseudophakic eyes with OAG not controlled on medication may achieve IOP control with reduced medication burden after MIGS implantation of two trabecular micro-bypass stents.

References

1. Samuelson TW, Katz LJ, Wells JM, et al. Randomized evaluation of the trabecular micro-bypass stent with phacoemulsification in patients with glaucoma and cataract. Ophthalmology 2011;118:459-467.
2. Myers, JB, Katz, LJ. Safety of trabecular bypass stent implantation in > 300 eyes with open-angle glaucoma. Presented at the 2011 AGS annual meeting, Dana Point, CA, March 2011.
3. Craven ER, Katz LJ, Wells JM, Giamporcaro JE. Cataract surgery with trabecular micro-bypass stent implantation in patients with mild-to-moderate open-angle glaucoma and cataract: Two-year follow-up. J Cataract Refract Surg 2012;38:1339-1345.

5. Long-term Surgical Risks of Trabeculectomy in the Collaborative Initial Glaucoma Treatment Study

PAUL R. LICHTER, Sarwar Zahid, David C. Musch, Leslie M. Niziol.

Kellogg Eye Center, University of Michigan, Ann Arbor, MI

Purpose: The Collaborative Initial Glaucoma Treatment Study (CIGTS) randomized half of its subjects to trabeculectomy as initial therapy for open-angle glaucoma. Incidence of endophthalmitis and other long-term surgical risks of trabeculectomy are reported.

Methods: Data were tabulated on the long-term post-operative complications in the 300 patients randomized to trabeculectomy in the CIGTS. The time-related probability of endophthalmitis, blebitis, and hypotony were estimated using Kaplan-Meier analyses.

Results: Fifteen of the original 300 subjects randomized to trabeculectomy did not undergo surgery due to patient refusal and other apparently random reasons. The remaining 285 patients underwent careful follow-up over an average of 7.2 years. Surgeon choice resulted in 163 of the 285 patients (57%) receiving intraoperative 5-fluorouracil (5-FU). Intraoperative mitomycin-C (MMC) was not permitted by protocol; however 4 patients received it, each constituting a protocol violation. Further surgical treatment was undertaken beyond the initial trabeculectomy in 50 of the 247 patients with a minimum of 5 years of follow-up. Bleb-related complications included blebitis in 8 patients, hypotony in 4 patients, bleb leak in 15 patients, and endophthalmitis in 3 patients. In 2 of the latter 3 patients, the diagnosis was presumptive. Kaplan-Meier calculations show the risk of blebitis and hypotony to each be 1.5% at 5 years and the risk of endophthalmitis to be 1.1%. Antimetabolite use was not associated with a greater risk of bleb-related complications.

Discussion: An earlier CIGTS manuscript reported that perioperative complications of CIGTS trabeculectomies were common, but relatively minor, short-lived, and not vision threatening. The incidence of longer-term complications is also important to a proper risk assessment of trabeculectomy and our study adds to the information in the literature on this subject. Since trabeculectomy reduces IOP to lower levels than most alternative glaucoma surgical interventions, risks of achieving this lower IOP must be weighed against procedures that may be safer, but cannot be expected to achieve the same low IOP result as does trabeculectomy. Our results support the relative safety of trabeculectomy in terms of its longer-term risks.

Conclusions: A low incidence of endophthalmitis and other longer-term complications after trabeculectomy in the CIGTS should be reassuring in clinical situations where surgically-induced low IOP is necessary.

Glaucoma Progression

6. Comparing the Rate of Rim Area Change in Eyes with Visual Field and Optic Disc Endpoints: The Confocal Scanning Laser Ophthalmoscopy Ancillary Study to the Ocular Hypertension Treatment Study

LINDA M. ZANGWILL, Sonia Jain, Keri Dirkes, Feng He, Robert N. Weinreb, Felipe A. Medeiros, Gary L. Trick, James D. Brandt, George A. Cioffi, Anne L. Coleman, Jeffrey M. Liebmann, Jody R. Piltz-Seymour, Mae O. Gordon, Michael A. Kass.

UCSD, La Jolla, CA, Henry Ford Health System, Detroit, MI, UC Davis, Sacramento, CA, Columbia University Medical Center, New York, NY, Jules Stein Institute, Los Angeles, CA, New York Eye and Ear Infirmary, New York, NY, University of Pennsylvania Health System, Bristol, PA, Washington University School of Medicine, St Louis, MO

Purpose: To compare the rate of rim area loss in ocular hypertensive eyes that developed visual field (VF) primary open angle glaucoma (POAG) endpoints to eyes that developed optic disc POAG endpoints, and to eyes with repeatable optic disc change identified by the OHTS Optic Disc Reading Center (ODRC).

Methods: 441 participants (832 eyes) enrolled in the CSLO Ancillary Study to the OHTS were included. POAG endpoint was defined as confirmed VF abnormality or a clinically significant ODRC optic disc deterioration attributed to POAG by the endpoint committee. The rate of HRT rim area loss was measured using multivariable mixed effects models.

Results: See Table comparing the rate of rim area loss in eyes 1) that developed POAG by VFs, 2) that developed POAG by optic disc alone, 3) with ODRC optic disc deterioration not yet clinically significant by the endpoint committee, and 4) with no change.

Discussion: The mean rate of rim area loss was approximately twice as fast in optic disc POAG endpoint eyes compared to VF POAG endpoint eyes and to eyes with ODRC optic disc changes not considered clinically significant.

Conclusions: These results suggest that measuring the rate of structural change provides important information, but should not replace VF testing for the clinical management of ocular hypertensive patients.

Rim Area Loss in Eyes

Initial VF and Optic Disc Change Criteria	N (eyes)	Rim Area Slope (95% CI) (mm2/yr)	P-Value compared to VF POAG Endpoint	P-Value compared to No Change
VF POAG Endpoint	21	-0.0079 (-0.0157, -0.0001)	NA	0.1655
Optic Disc POAG Endpoint Only	45	-0.0169 (-0.0225, -0.0113)	0.0426	<0.0001
Optic Disc Reading Center Change Only not yet clinically significant	27	-0.0094 (-0.0161, -0.0027)	0.54	0.0012
No Change	731	-0.0021 (-0.0031, -0.0011)	0.1655	NA

7. The Ocular Hypertension Treatment Study: Difference in the Effect of Long Term IOP Variability on the Risk of Developing POAG

MAE O. GORDON, Feng Gao, Julia A. Beiser, J Phillip Miller, Michael A. Kass.

Washington University School of Medicine, St. Louis, MO

Purpose: To determine if the risk of developing POAG is increased by higher long-term IOP variability as measured by standard deviation (SD), maximum IOP, range, coefficient of variation (CV) and percent change.

Methods: Analysis of baseline and follow-up IOP in 717 participants randomized to observation (OBS) and 720 participants to topical ocular hypotensive medication (MED). Incident POAG was defined as confirmed visual field abnormality or optic disc deterioration of clinically significant magnitude attributed to POAG by an Endpoint Committee. Univariate and multivariate (MV) time dependent Cox proportional hazards models were used to estimate hazard ratios. Serial landmark models were used to estimate the C-index averaged over time. Covariates in MV models were baseline age, CCT, PSD, VCD and follow-up IOP.

Results: IOP variability had statistically significantly greater effect in the medication group than in the observation group. Thus, we report results separately by randomization group. In the OBS group, 102 eyes of 717 participants developed POAG in OHTS I (median f/up 6.9 yrs.). None of the measures of IOP variability independently increased the risk of POAG. In the MED group, 111 eyes of 720 participants developed POAG in OHTS I and II (median f/up 13.0 yrs.); SD (HR 1.21, p=0.024) and CV (HR. 1.19, p=0.045) independently increased the risk of developing POAG. In the MED group, the C-statistic for the "basic" multivariate model with covariates only was 0.755. After adding SD to these covariates, the C-statistic increased to 0.766. After adding CV to these covariates, the C-statistic increased to 0.765.

Discussion: Higher long term IOP variability in the observation group did not independently increase the risk for developing POAG i.e., natural history of POAG. However, in the medication group, higher long-term IOP variability, specifically SD and CV, increased the risk of developing POAG. The addition of either SD or CV did little to improve the predictive accuracy of the MV model.

Conclusions: Long-term variability of IOP was found to be a risk factor for POAG only among treated patients. Factors contributing to IOP variability among treated patients include inherent patient-specific biologic variability and medication consistency among other factors.

8. Nerve Fiber Layer and Ganglion Cell Complex Measurements by OCT as Risk Factors for Visual Field Progression in Glaucoma

XINBO ZHANG, Rohit Varma, Joel S. Schuman, David S. Greenfield, David Huang.

Oregon Health & Science University, Beaverton, OR, University of Southern California, Los Angeles, CA, University of Pittsburgh, Pittsburgh, PA, University of Miami, Miami, FL, Oregon Health & Science University, Portland, OR

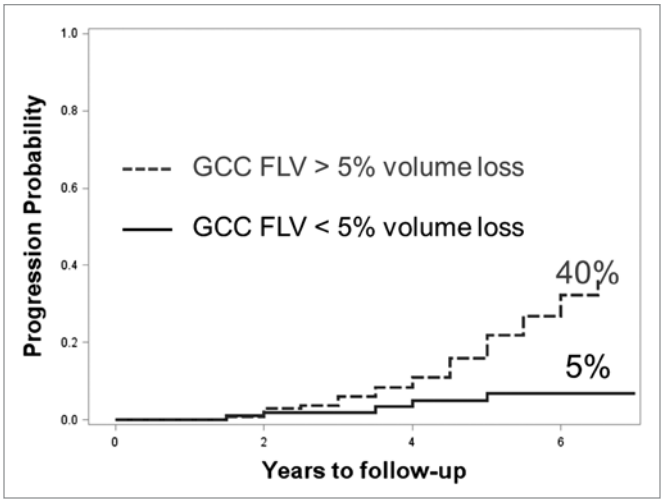
Purpose: The purpose of the study is to determine whether optical coherence tomography (OCT) anatomic measurements are useful in predicting the development of glaucomatous visual field (VF) defects.

Methods: We analyzed the data from perimetric glaucoma (PG) patients enrolled in the multi-center longitudinal Advanced Imaging for Glaucoma Study (www.AIGStudy.net). Both time-domain (TD) and Fourier-domain (FD) OCT were used to measurement thickness profiles of nerve fiber layer (NFL). Ganglion cell complex (GCC) thickness maps were measured with FD-OCT. Standard automated perimetry was used to assess VF. Subjects were followed every 6 months. VF glaucoma progression was defined as three consecutive follow-up VF's that show consistent focal worsening of defects (three completely filled black triangles) by Humphrey Glaucoma Progression Analysis (GPA) software. The Cox proportional hazard model was used to calculate the hazard ratios (HR) for the risk factors; the results were adjusted for correlation between the eyes from the same individual. A multivariate model was fitted for each of the OCT parameters with age and VF pattern standard deviation (PSD).

Results: The analysis included 340 eyes (222 participants) with average age of 61.8, among which 127 (57%) are female and 24 (11%) are African Americans. The average PSD at baseline was 5.6 while the average mean deviation (MD) was -4.8. The average follow-up time was 36 months. In the cohort, 35 eyes had VF progression. The most significant risk factor for visual field progression is GCC Focal Loss Volume (FLV) from FD-OCT (HR = 1.16, per 1% higher, p =0.004). The figure shows the Kaplan-Meier survival curves for patients with high GCC FLV (> 5%) and and low GCC FLV (<=5%), the progression probability is 8 times as high after 6 years of follow-up.

Discussion: Glaucoma patients with thinner GCC, NFL, or with higher FLV are more likely to have worsening of visual field defects, even after controlling for age and disease severity (VF PSD) in multivariate analysis.

Conclusions: GCC and NFL measurements using OCT can provide glaucoma patients in care with a better prediction in glaucoma progression.



9. Treatment-to-Outcome Gap in Glaucomatous Eyes Undergoing Trabeculectomy

TRACY M. WRIGHT, Carlos G. De Moraes, Felipe A. Medeiros, Robert N. Weinreb, Jeffrey M. Liebmann, Robert Ritch.

New York University, New York, NY, Hamilton Glaucoma Center, UC San Diego, La Jolla, CA, Einhorn Clinical Research Center, New York Eye and Ear Infirmary, New York, NY

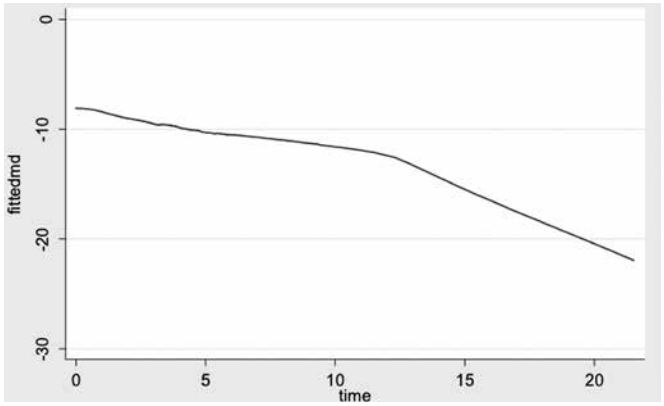
Purpose: We hypothesized that intraocular pressure (IOP) lowering interventions in glaucoma may not lead to immediate changes in rates of visual field (VF) progression given what we called a 'treatment-to-outcome gap'. In other words, once the IOP is lowered at a specific time-point, VFs may still progress due to the detrimental effects of pre-existing injury to retinal ganglion cells (RGC) during the period they were exposed to higher IOP. We tested this hypothesis in eyes undergoing trabeculectomy and estimated the average time between IOP reduction and reduction of the slope of VF progression.

Methods: Data from glaucoma patients who underwent a single trabeculectomy were collected retrospectively. We included only eyes with ≥5 SITA-SAP VFs before and after surgery, and excluded those who had repeat surgery during the time period of the analysis. Variables analyzed were VF mean deviation (VFMD), IOP at the date of each VF test, age at time of surgery, and central corneal thickness CCT. Longitudinal data from each eye were analyzed using a 'spline smoothing' statistical technique which generates fitted curves of VFMD and IOP over time. First derivatives at each time-point were calculated for these curves allowing a comparison between changes in IOP and VFMD slopes. Mixed linear models were used to test the relationship between fitted IOP, fitted VFMD slopes, and 'lag slopes' (the effect of IOP at one visit on the VFMD slopes on following visits).

Results: 56 eyes of 56 patients (mean age, 63.4±13.3 years) were included. Figure1 depicts the fitted VFMD and fitted IOP change over time. At each time point, for each 1 mmHg IOP increase, the VFMD slopes became 0.050 dB/yr more negative (95% CI= -0.075 to -0.025 dB/yr; P<0.001). For the 'lag slopes' analysis, for each 1 mmHg IOP increase at one visit, the VFMD slopes became 0.056 dB/yr more negative at the following visit (95% CI= -0.080 to -0.032 dB/yr; P<0.001). A comparison between the fitted IOP slope and the fitted VFMD slope suggests an average of 40 months interval between the maximum rate of IOP decline (post-surgery) and flattening of the VFMD slopes to zero (Figure 2).

Conclusions: Current IOP measurements determine not only current rates, but also future rates of VF progression, even after substantial IOP reduction has been accomplished surgically. A lag time exists between IOP reduction and VF stabilization. This implies continued RGC death from antecedent injury.

Support: By the Edith C. Blum Foundation, New York, NY; the Sheila Evers Research Fund of the New York Glaucoma Research Institute, New York, NY.



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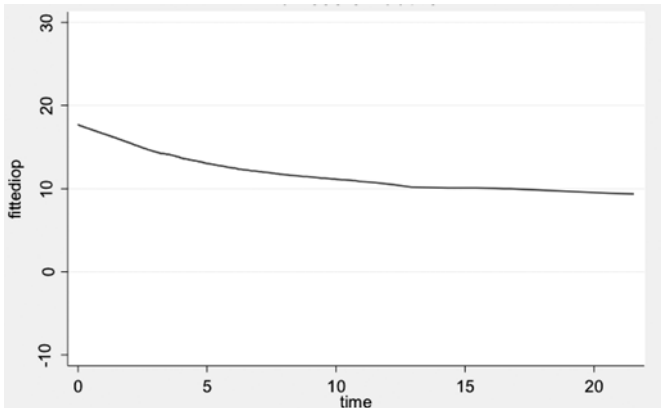

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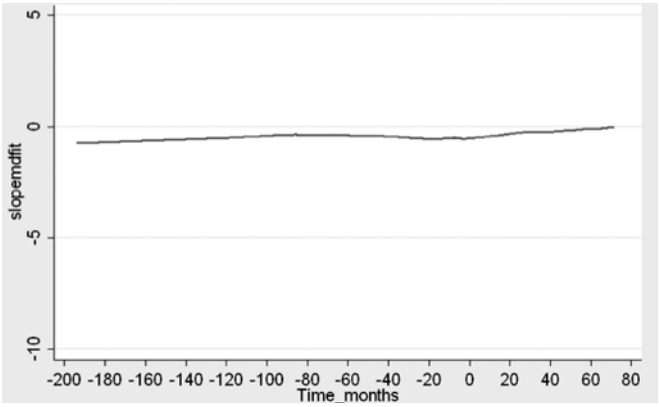
Figure 1. Fitted MD vs. Fitted Time (top) and Fitted IOP vs. Fitted Time (bottom).



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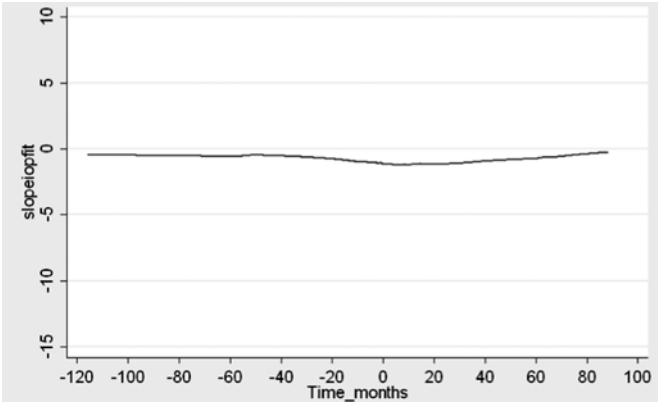

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Figure 2. Fitted VFMD slopes vs. Time in months (top) and Fitted IOP slopes vs. Time in months (bottom). In the top figure, note that its takes on average 70 months after surgery for the VFMD slopes to become more positive and reach 'zero'. In the bottom figure, note that the maximum IOP reduction occurs between surgery date ('zero') and 30 months, when the rate of IOP reduction starts to increase (despite still being negative). The difference (70-30=40 months) is the estimate of the 'treatment-to-outcome gap'.

10. Large and Sustained Blood Pressure Dips Are Associated with Visual Field Progression in Normal-Tension Glaucoma

CARLOS G. DE MORAES, Alissa R. Link, Marty T. Wells, Adji Dieng, Jeffrey M. Liebmann, Robert Ritch, Mary E. Charlson.

New York University School of Medicine, New York, NY, Weill Cornell Medical College, New York Presbyterian Hospital, New York, NY, Cornell University, Ithaca, NY, New York Eye and Ear Infirmary, New York, NY

Purpose: Cross-sectional studies suggest that nocturnal systemic hypotension is more common among normal-tension glaucoma (NTG) patients with sustained progressive visual field (VF) loss. However, most studies relied on a single blood pressure (BP) recording and did not consider the patients' nocturnal BP in relation to their usual systemic BP.[1,2] The concept of the 'autoregulatory range' provides an important framework to evaluate nocturnal BP and glaucomatous loss. Autoregulation normally keeps ocular perfusion constant while systemic BP varies. We tested the hypothesis that progressive VF loss in NTG occurs at least in part due to systemic BP falls below the lower limit of autoregulation, resulting in ischemia and optic nerve injury, and that the extent and duration of the nocturnal fall in mean arterial pressure (MAP) below the lower autoregulatory limit may be predictors of progression.

Methods: Patients from a referral glaucoma practice diagnosed with NTG and who had reproducible VF defects were screened for potential eligibility. All included patients had a history of IOP 24 mmHg) prior to glaucoma treatment. Patients with a VF defect not attributable to glaucoma were excluded. A complete ophthalmologic examination was performed at baseline and follow-up visits. The baseline evaluation included basic demographic and clinical characteristics, including systemic comorbid conditions. All systemic medications were recorded, with an emphasis on anti-hypertensive medications. Patients had their BP monitored every 30 minutes for 48 hours with an ambulatory recording device at 6-month intervals. All included patients had a minimum of 8 VF tests and progression was defined based on the EMGT criteria and rates of MD change (dB/yr).

Results: 166 eyes of 85 NTG patients were included (mean age of 65 years; 67% were women. 24% of patients progressed over a mean follow-up period of 5 years based on the EMGT criteria. Multivariate analysis revealed that the total time that the MAP during sleep was below the daytime mean was a significant predictor of subsequent VF progression (p=0.022). In addition, the total area under curve, that is taking into account the magnitude and duration the BP fell below daytime MAP, was also a predictor of progression (p=0.020). When looking at rates of MD change (dB/yr), there was a significant association with the total time the BP was below MAP (p=0.006), asthma (p<0.001), and use of beta blockers (p<0.001).

Discussion: Our data suggests that nocturnal BP dips below the daytime mean MAP, as well as the magnitude and duration of theses dips, are predictors of progression in NTG. It is plausible that physiologic low nocturnal BP and/or overtreatment of systemic hypertension may aggravate functional outcomes of NTG patients.

Conclusions: 24-hour BP monitoring in NTG patients may be warranted.

References

1. Graham SL, et al. *Ophthalmology* 1995
2. Leske MC, et al. *Ophthalmology* 2007

Anterior and Posterior Segment Imaging

11. Deformation of the Non-Human Primate (NHP) Optic Nerve Head (ONH) Connective Tissues within 3-D Histomorphometric Reconstructions of Moderate and Severe Experimental Glaucoma (EG) Eyes

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Purpose: To characterize ONH connective tissue (CT) deformation within 3D histomorphometric reconstructions of 12 moderate to severe (M/S) EG NHP eyes relative to 9 previously reported early EG (EEG) eyes.[1]

Methods: Trephinated ONH and peripapillary sclera from both eyes of 12 adult NHPs, (9 - 21 years old) that had been perfusion fixed at IOP 10 mmHg with one normal, and one M/S EG eye (qualitatively determined by the magnitude of longitudinal change in confocal scanning laser tomography) were serial sectioned, 3D reconstructed, 3D delineated and parameterized using our existing techniques[1]. Significant between eye differences for each parameter, for each M/S EG eye (compared to its contralateral control), exceeded previously reported maximum physiologic inter-eye differences (PIDmax)[2] and were compared to the range of EEG eye change.[1]

Results: M/S EG eyes were ordered by overall ONH CT deformation as characterized by Post-BMO Total Prelaminar Volume,[1] (see table below), which increased from 40 to 578% vs 36 to 188% in the EEG eyes. Laminar posterior deformation ranged from -37 to -437 µm in the M/S EG eyes vs -29 to -184 µm in the EEG eyes. Lamina thickness increased 30 to 113 µm in 3 M/S EG eyes, was unchanged in 6 M/S EG eyes and was thinned 23 to 31 µm in 3 M/S EG eyes compared to increases ranging from 20 to 61 µm in 8 of 9 EEG eyes. Posterior scleral canal opening (PSCO) offset expansion (range, 25 - 33 µm) was less than that in the EEG eyes (range, 30 - 85 µm) with 1 M/S EG eye demonstrating PSCO contraction (64 µm). Anterior laminar insertion (ALI) and Posterior laminar insertion (PLI) depth (relative to BMO reference plane) was consistently greater in M/S EG compared to EEG eyes.

Conclusions: Global posterior deformation and thickening of the lamina cribrosa continues throughout NHP M/S EG. However, as previously described in humans and monkeys, the lamina is thinned in the most severely deformed eyes. Taken together, our EEG and M/S EG eye data suggest the lamina thickens in most NHP eyes early in the neuropathy then thins as the neuropathy progresses. However, the hypothesis that the lamina cribrosa thins primarily within some eyes is under study using longitudinal SDOCT imaging.

References

1. Yang, et al. IOVS. 2011;52:345-363.
2. Yang, et al. IOVS. 2009;50:224-234.

Parameters	*Previously Reported Global Maximum Physiologic Inter-Eye Differences(PIDmax)[2]*	*Range of Previously Reported Global Between-Eye Differences[5] in 9 EEG eyes[1]*		Range of Global Between-Eye Differences[5] in 12 M/S EG eyes	
		Min[3]	*Max[4]*	Min[3]	Max[4]
Neural Canal Architecture (µm)					
BMO Offset	*9*	*-12*	*96*	**12**	**60**
ASCO Offset	*16*	*17*	*71*	**25**	**66**
ALI Offset	*16*	*19*	*71*	**18**	**77**
PLI Offset	*18*	*20*	*139*	**-31**	**97**
PSCO Offset	*22*	*30*	*85*	**33**	**-64**
ASAS Offset	*18*	*-32*	*98*	**21**	**94**
ASCO Depth	*15*	*-18*	*-35*	**19**	**-31**
ALI Depth	*20*	*-35*	*49*	**21**	**112**
PLI Depth	*20*	*-38*	*71*	**27**	**158**
PSCO Depth	*27*	*40*	*-58*	**43**	**-78**
ASAS Depth	*25*	*-36*	*-88*	**40**	**-90**
ONH Connective Tissue (µm)					
Lamina Cribrosa Position	*16*	*-29*	*-184*	**-37**	**-437**
Peripapillary Scleral Position	*16*	*21*	*59*	**-47**	**60**
Lamina Cribrosa Thickness	*18*	*20*	*61*	**-31**	**73**
Scleral Flange Thickness	*14*	*24*	*24*	**25**	**-29**
ASAS Scleral Flange Thickness	*20*	*NA*	*NA*	**25**	**36**
Peripapillary Scleral Thickness	*5*	*-32*	*59*	**-15**	**34**
ONH Laminar Cupping (mm³)					
Post-BMO Total Prelaminar Volume	*28%*	*36%*	*188%*	**40%**	**578%**

ONH Connective Tissue Alterations within 12 Moderate to Severe (M/S) Experimental Glaucoma (EG) eyes

1 Previously reported values for 9 EEG eyes[1] are included for comparison.

2 Maximum Physiologic Inter-Eye Difference (PIDmax) values for 5 Bilaterally Normal Animals[2] are included for comparison.

3 Minimum values of the range are minimum by magnitude or most negative or both.

4 Maximum values of the range are maximum by magnitude without regard to direction

5 Between-eye differences in the EG eye relative to its contralateral normal eye exceed previously reported PIDmax[2].

12. Reduced Schlemm's Canal Size in Glaucoma Observed by Spectral Domain Optical Coherence Tomography

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Purpose: Non–invasive imaging of the primary aqueous outflow system may now be made with spectral domain optical coherence tomography (SD-OCT).[1] The purpose of this study was to determine its ability to detect differences in Schlemm's canal cross-sectional area (SC-CSA) between normal healthy and eyes with primary open angle glaucoma (POAG).

Methods: One random eye in 10 healthy (41 ± 17 years) and 9 POAG (64 ± 9 years) subjects were imaged by SD-OCT (Cirrus, Carl Zeiss Meditec, Dublin CA) using the anterior segment 512 x 128 cube scan pattern. SC-CSA was measured in 31 samples per scan volume, traversing a 1mm length of canal centered on a collector channel ostium, by two independent masked observers by manual tracing in ImageJ. Visual field was assessed in the POAG subjects (Humphrey Field Analyzer, Carl Zeiss Meditic, Dublin CA). Mean and quartile SC-CSA's were compared by analysis of variance.

Results: All morphometric parameters were statically significantly smaller in glaucoma (table, mean ± standard deviation). Mean deviation in the glaucoma cohort was -3.5 ± 3.3 dB.

Parameter	Healthy (μ^2)	Glaucoma (μ^2)	% Difference	Significance
Mean	3,262.6 ± 1,875.7	1,396.4 ± 1,096.8	-57.1%	P < 0.001
25th Percentile	2,273.1 ± 1,550.6	705.9 ± 706.9	-68.9%	P < 0.001
50th Percentile	3,103.5 ± 1,885.1	1,225.1 ± 1,041.4	-60.5%	P < 0.001
75th Percentile	4,072.4 ± 2,226.7	1,939.8 ± 1,553.1	-52.3%	P < 0.001

Discussion: There was a difference in age between the two cohorts, and some difference in SC-SCA may have been due to age. Despite early to moderate disease in the glaucoma subjects, the distribution of SC-CSA's was significantly smaller in glaucomatous eyes. Observed in histological sections[2] and implied in pilot data in living eyes[1], the present study confirms morphometric changes in structures of the primary aqueous humor outflow pathway visualized non-invasively in human eyes.

Conclusions: On average, SC CSA was 60% smaller in glaucomatous eyes. Some of this difference may have been due to age. This significant difference may be observed non-invasively by SD-OCT.

Support: R01-EY013178, P30-EY008098; Eye and Ear Foundation (Pittsburgh, PA); Research to Prevent Blindness

References

1. Kagemann L, Wollstein G, Ishikawa H, et al. Identification and assessment of Schlemm's canal by spectral-domain optical coherence tomography. Invest Ophthalmol Vis Sci 2010;51:4054-9.
2. Dietlein TS, Jacobi PC, Luke C, Krieglstein GK. Morphological variability of the trabecular meshwork in glaucoma patients: implications for non-perforating glaucoma surgery. Br J Ophthalmol 2000;84:1354-9.

13. Identification and Classification of the Collector Channel System with in-vivo High Definition Anterior Segment OCT

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Purpose: To describe, evaluate and classify *in vivo* the areas of junction between Schlemm's canal (SC) and the collector channels (CCs) in normal adult human eyes using a novel technique of serial high definition anterior segment Fourier-domain OCT imaging (FDASOCT).

Methods: 20 normal subjects (mean age: 25±4.0 years) were imaged using FDASOCT scans over the right temporal limbus. First, the area was inspected for CCs; when a clearly visible SC-CC junction was identified, a standardized protocol of serial radial and tangential scans was performed. The highest quality image of each set capturing the ostium of the same CC in both scan orientations was selected for quantitative assessment. The serial scans were used to create composite images which were qualitatively evaluated.

Results: In the radial scans, we evaluated SC cross sectional area (9,248±2,500 μm²), maximum width (28±10 μm) and length (365±46 μm) as well as CCs maximum lumen diameter (12±4 μm). The ostium diameter (18±8 μm) and SC maximum (28±9 μm) and minimum width (12±6 μm) in a 500 μm long section around the junction were evaluated in the tangential scans. Based on their morphometry, CCs were classified into small or large; based on their course, they were divided in anterior and posterior CCs.

Conclusions: The anatomy of the SC-CCs junctions can be objectively measured with real-time, high resolution ASFDOCT and is enhanced by the use of serial radial and tangential imaging. We propose a classification of the CC based on their *in vivo* anatomy.

Fig 1. Tangential ASFDOCT scans capturing the SC-CC junctions. CCs were divided according to their morphometry into small (A) and large (B).

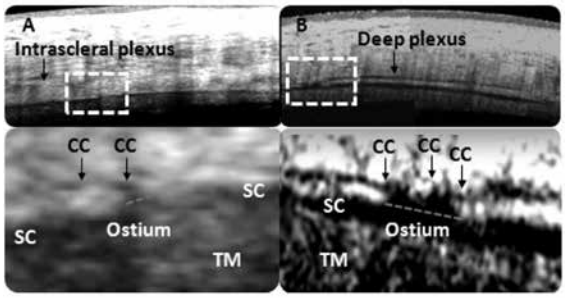
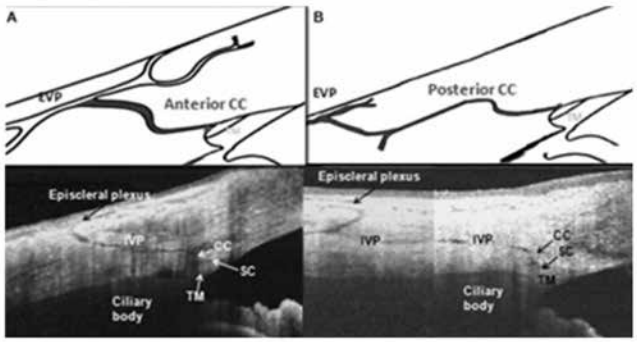


Fig 2. Composite radial images. According to their course CCs were classified into anterior (those immediately reaching the overlying episcleral plexus) and posterior (those following a longer intrascleral course, B). CC=Collector channel, IVP=Intrascleral vascular plexus, SC=Schlemm's canal, TM=Trabecular meshwork



14. Retinal Blood Flow in Glaucomatous Eyes with Single Hemifield Damage

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Purpose: To examine the hypotheses that retinal blood flow (RBF) is significantly reduced in the abnormal visual hemifield of glaucomatous eyes with single-hemifield damage; and that there are significant associations between reduced retinal sensitivity (RS) in abnormal hemifield, and RBF, retinal nerve fiber layer thickness (RNFL) and ganglion cell complex thickness (GCC) in the corresponding hemisphere.

Methods: Glaucomatous eyes with visual field loss confined to a single hemifield underwent Spectral-domain optical coherence tomography (SDOCT), Doppler SDOCT and standard automated perimetry (SAP). Using Dual Angle Protocol, a double-circle scanning pattern was applied to measure the venous BF. Disc photos were registered with Doppler images to identify the veins. RBF was derived from the recorded Doppler frequency shift and the calculated angle between the beam and the vessel. Total and hemispheric RBF values were calculated. Average, superior and inferior RNFL and GCC were measured. Shapiro-Wilk Test, ANOVA with Tukey HSD and regression analyses were performed.

Results: 30 eyes (age 61.5±9.2 yrs) were included. Mean RS was reduced in abnormal hemifield compared with the normal hemifield (22.5±7.1 vs 28.5±2.0dB, $p<0.001$). Mean RBF was reduced in retinal hemisphere associated with abnormal hemifield vs the opposite hemisphere (15.3±5.4 vs 19.3±8.4 µL/min, $p=0.03$). The RNFL was thinner in corresponding abnormal hemisphere vs the opposite hemisphere (87.0±20.2 vs 103.7±20.6µm, $p=0.002$). The GCC was thinner in corresponding abnormal hemisphere vs the opposite hemisphere (80.6±10.3 vs 83.6±10.1µm, $p=0.04$). The RBF was associated with RNFL ($r=0.41$, $p=0.02$) and GCC ($r=0.43$, $p=0.02$), but not with the RS in 1/lambert or dB ($r=0.31$, $p=0.09$; $r=0.30$, $p=0.10$ respectively) in corresponding abnormal hemisphere and abnormal hemifield.

Discussion: Reduced RBF associated with thinner RNFL and GCC in the corresponding abnormal hemisphere, indicates that retinal blood flow is involved in the pathogenesis of glaucoma.

Conclusions: In glaucomatous eyes with single-hemifield damage, retinal blood flow is significantly reduced in the hemisphere associated with abnormal hemifield.

15. Measurement of Optic Nerve Head Blood Flow in Glaucoma by OCT Angiography

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Purpose: To detect changes in optic nerve head (ONH) circulation in glaucoma patients using optical coherence tomography (OCT) angiography.

Methods: One eye of each subject was scanned by a high-speed (100,000 A-scans/sec) 1050 nm wavelength swept-source OCT. The ONH angiography scan spans 3x3 mm and comprises 200x200x8 A-scans acquired in 3.4 sec. Flow was detected using the split-spectrum amplitude-decorrelation angiography (SSADA) algorithm. Motion artifacts were removed by 3D orthogonal registration and merging of 4 scans. In the merged scan volume, *en face* maximum projection was used to obtain 2D disc angiograms, from which average decorrelation values (flow indices) were computed from the segmented disc areas. Visual field (VF), disc photography, and confocal scanning laser ophthalmoscopy (cSLO, HRT II) were used to provide standard glaucoma diagnostic evaluation. Comparisons between glaucoma and normal groups were analyzed by Wilcoxon rank sum test. Correlations between SSADA flow index and other measures of function and structure were assessed by linear regression.

Results: Ten glaucoma subjects (6 perimetric, 3 preperimetric, and 1 ocular hypertensive) and twenty normal human subjects were compared. In normal discs, a dense microvascular network was visible on OCT angiography (Fig. 1B). This network was visibly attenuated in all glaucoma subjects (Fig. 1E). The intra-visit repeatability, inter-visit reproducibility, and normal population variability of SSADA-based whole disc flow index were 1.1%, 6.6%, and 4.8% CV respectively. In the glaucoma group, the flow index was reduced by 19% for the whole disc, and by 24% for the temporal ellipse (Fig. 2). These reductions were significant even after accounting for age, cup/disc ratio (photograph), and rim area (cSLO). Both flow indices was significantly ($P<0.01$) and highly correlated ($R < -0.8$) with VF pattern standard deviation.

Discussion: OCT angiography, generated by the new SSADA algorithm, is a highly reproducible method for the measurement of ONH perfusion.

Conclusions: OCT angiography could be useful in the evaluation of glaucoma and glaucoma progression.

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Glaucoma Management and Therapy

16. A Prospective Randomized, Multicenter, Single-masked, Parallel, Dose Ranging (VOYAGER) Study to Compare the Safety and Efficacy of BOL-303259-X to Latanoprost in Subjects with Open Angle Glaucoma or Ocular Hypertension

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Purpose: To determine the most effective drug concentration of BOL-303259-X in the reduction of intraocular pressure (IOP) and assess the safety and efficacy of BOL-303259-X compared to latanoprost 0.005% ophthalmic solution.

Methods: Eligible subjects with a diagnosis of open-angle glaucoma or ocular hypertension with IOP ≥ 26 mmHg at at least one time point and ≤ 32 mmHg at all time points were offered enrollment. Following randomization, 413 subjects were assigned to one of five treatment groups: BOL-303259-X 0.006%, 0.012%, 0.024%, 0.040% or latanoprost 0.005% ophthalmic solutions. Subjects were seen for 7 study visits over the course of 29 days. Doses were administered once daily in the evening for 28 consecutive days. The primary and secondary efficacy endpoints were a reduction in mean diurnal IOP at Day 28 and sustained IOP reduction on Day 29 respectively. Safety assessments included measurement of adverse events, best-corrected visual acuity, ocular signs and symptoms as well as vital signs. An ANCOVA model with fixed-effect terms was used; for the change from baseline IOP, 1-sample t-tests were performed.

Results: Subjects in the intent-to-treat population had a mean age of 61.0 years, were predominantly white (74.1%), and female (61.7%) with 43.6% being naïve to treatment at time of enrollment. Demographic and baseline characteristics were similar across treatment groups. At Day 28, mean diurnal IOP reduction in the BOL-303259-X 0.024% (9.0 mmHg; p = 0.0051) and 0.040% (8.9 mmHg; p = 0.0089) treatment groups was greater than in the latanoprost group (7.8 mmHg); on Day 29, a greater mean diurnal IOP reduction was still observed in the BOL-303259-X 0.024% group (7.20 versus 6.25 mmHg, p = 0.0505) compared to latanoprost. All ocular treatment-emergent adverse events were mild or moderate in severity. Overall, the percentages of subjects with conjunctival hyperemia were similar across treatment groups.

Conclusions: BOL-303259-X is a safe and effective IOP-lowering agent at multiple concentrations, reducing IOP in a dose-dependent manner. BOL-303259-X 0.024% QD statistically significantly reduced IOP greater than latanoprost with a similar side effect profile.

17. The Cost of Glaucoma Care Provided to a Sample of Medicare Beneficiaries from 2002–2009

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Purpose: To estimate payments for glaucoma care among Medicare beneficiaries from 2002 to 2009.

Methods: Data from a 5% random subsample of Medicare billing information from the years 2002, 2006 and 2009 were collected from the carrier, outpatient hospital, inpatient hospital and beneficiary summary files. Medicare beneficiaries with both Parts A and B, fee for service enrollment for > 1 month during the year, who had one of a defined set of glaucoma diagnostic codes were included if they had one glaucoma visit, glaucoma diagnostic test, or glaucoma laser/surgical procedure. Groups coded as open angle, angle closure, or other glaucoma were categorized separately. Claims were classified into glaucoma care, other eye care and other medical care.

Results: In 2009, overall glaucoma payments were $37.4 million for the 5% sample, for an overall estimated cost of $748.3 million, or 0.4% of all Medicare payments. Office visits comprised nearly one-half of glaucoma-related costs, diagnostic testing was about one-third, and surgical and laser procedures were about 10% of costs each. Coded OAG and OAG suspects accounted for 87.5% of glaucoma costs, while cost per person was highest in other glaucoma, followed by ACG, then OAG. Fewer than 3% of OAG patients were estimated to undergo surgery and about 7% had laser trabeculoplasty in 2009. Laser iridotomy accounted for the highest costs among ACG (35.4% of their total). Other glaucoma patients had the highest proportion of costs devoted to surgery (26.4%), particularly tube-shunt surgeries. The non-glaucoma eye care for glaucoma patients was 67% higher than that for glaucoma care, chiefly related to cataract surgery and diagnosis/treatment of retinal diseases. From 2002 to 2009, glaucoma care costs rose 30%, and the cost per person per year rose from $197 to $228, due to increased reimbursement for visits, an increased number of OAG suspects, more higher-level visits, and more laser and surgical procedures.

Conclusions: Payments for glaucoma were less than 1/200th of all Medicare payments, increasing from 2002_2009 at less than the rate of general or medical inflation. Cataract and retinal eye care for glaucoma patients substantially exceeded the cost of their glaucoma care. Visit charges represent the largest category of costs.

18. Evaluating IOP Reduction Resulting from Sustained Delivery via Travoprost-Eluting Hydrogel Punctum Plugs

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Purpose: To assess mean IOP reduction from baseline over 30 days and 60 days in glaucoma or ocular hypertensive patients treated with the Travoprost Punctum Plugs (TPP)

Methods: Polyethylene glycol hydrogel punctum plugs designed to deliver travoprost for 30 and 60 days were evaluated in a series of 2 prospective studies. 17 and 30 patients with glaucoma or ocular hypertension were enrolled at two institutions in Singapore and South Africa, respectively. In both, naïve and previously treated patients (after undergoing washout) were enrolled and had a TPP inserted in either the upper or lower puncta. Patients with a baseline IOP of < 22 and > 34mm Hg were excluded. At baseline and approximately every two weeks after insertion, the IOP was measured at 8AM, 10AM, and 4PM through 30 and 60 days for Study 1 and 2, respectively.

Results: A clear and sustained IOP reduction from baseline was observed in patients treated with TPP. Mean IOP reduction was greater than 5mm Hg at 30 days in Study 1 across all 3 timepoints. Only 1 from 17 subjects required removal of the plugs because of persistent epiphora. In Study 2 No unanticipated adverse events or serious adverse events occurred, and at 60 days post-insertion, the mean IOP reduction was also greater than 7mm Hg. Overall, plugs were retained well (based on visualization and/or IOP reduction criteria) and were considered straightforward to insert. Hyperemia was not noted to be prominent compared to baseline levels.

Discussion: Initial safety and efficacy was demonstrated for TPP. Therapeutic levels of travoprost were maintained when extending the duration of therapy from 30 days to 60 days.

Conclusions: Extending the duration of the therapeutic effect of the TPP is viable and may be advantageous in overcoming patient non-compliance to topical therapy.

19. A Comparison of Trabeculectomy Surgery Outcomes with Mitomycin-C Applied by Intra-Tenon Injection Versus Sponge Method

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Purpose: The ideal trabeculectomy bleb is described as diffuse with normal vascularity[1] while focal, cystic blebs may be associated with leaks. Intra-Tenon injection of MMC may offer advantages such as creating a more diffuse bleb and providing faster application times during surgery.[2] We investigate the outcomes of trabeculectomy surgery with Mitomycin-C (MMC) applied by intra-Tenon injection versus sponge method.

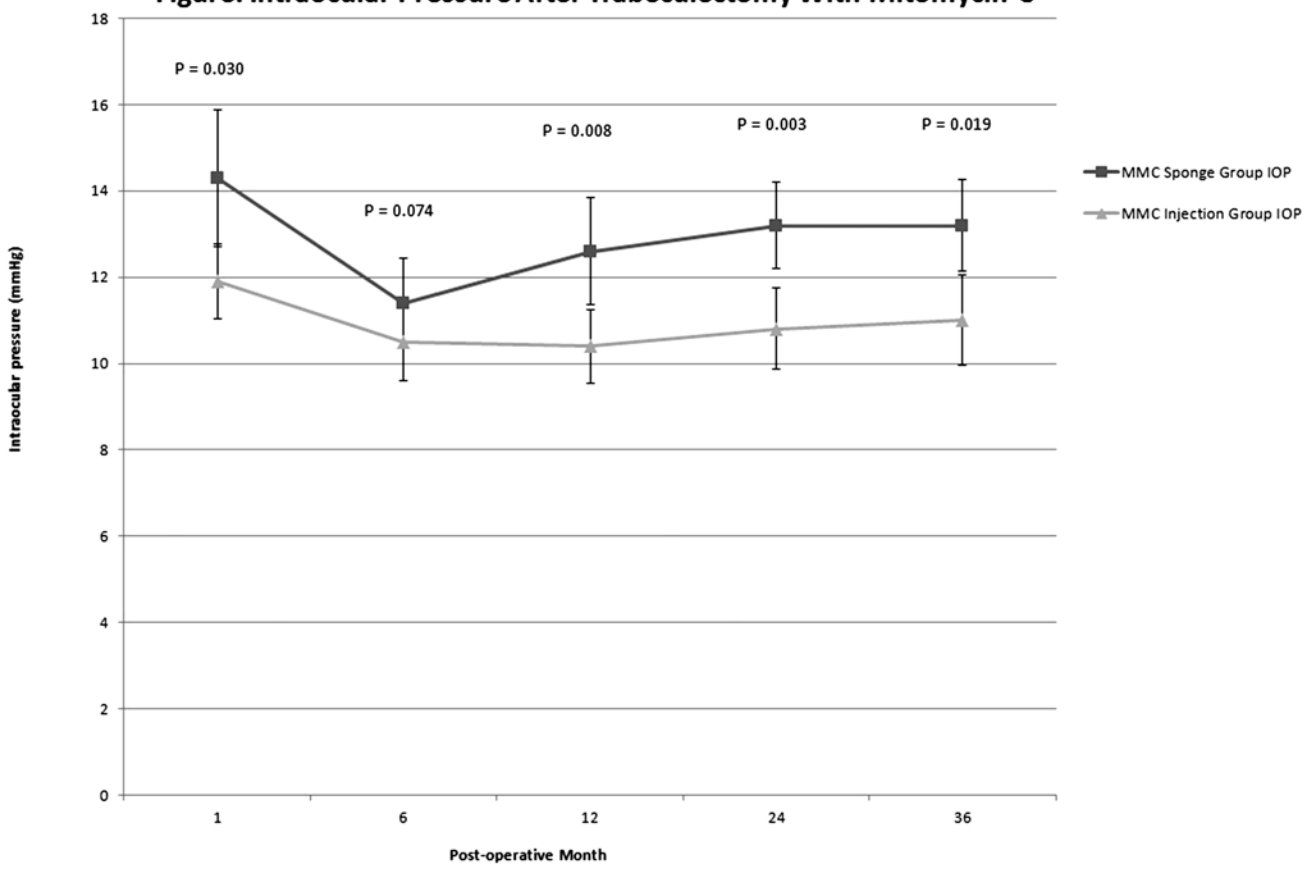
Methods: We performed a retrospective review of trabeculectomy performed with MMC applied by either intra-Tenon injection prior to the initial incision or by sponge under the conjunctival flap. Main outcome measures compared between groups were intraocular pressure (IOP), medication use and complications. Treatment success was defined as IOP ≤ 21 mmHg or IOP reduced by 20% or greater from baseline with or without the use of glaucoma medications, without additional glaucoma surgery and without a devastating complication (NLP vision, endophthalmitis).

Results: A total of 231 eyes that had received trabeculectomy surgery with MMC with at least 1 month of follow up were included in this study. Lower IOP was noted in the MMC injection group through 36 months post-operatively (Figure). Overall treatment success was 80% in the MMC injection and 70% in the MMC sponge group at post-operative year 3 but this difference did not reach statistical significance. Medication use was significantly lower in the MMC injection group (0.49 vs 0.94 meds) at 3 years (p=0.0328). The late (> 1 month) complication of a tense or vascularized bleb was noted more often in the MMC sponge group (p = 0.009). Other complications (e.g., bleb leaks, choroidal effusions) were not statistically different between groups.

Discussion: In our retrospective study, Mitomycin-C applied by injection resulted in lower IOP, and the need for fewer glaucoma medications. Direct and diffuse application of MMC by injection may promote less scarring and vascularization of the bleb.

Conclusions: Intra-Tenon injection of MMC may provide the advantage of lower IOP and the need for fewer glaucoma medications.

Figure. Intraocular Pressure After Trabeculectomy With Mitomycin-C



20. Using Filtered Forecasting Techniques to Determine Personalized Monitoring Schedules for Patients with Open Angle Glaucoma

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Purpose: To determine whether dynamic and personalized schedules of visual field (VF) tests and intraocular pressure (IOP) measurements for patients with open angle glaucoma (OAG) result in an improvement in disease progression detection compared to fixed interval schedules for these evaluations.

Methods: Data from perimetry, tonometry, and relevant sociodemographic factors were obtained from a subset of participants with moderate or advanced OAG who had been enrolled in the Collaborative Initial Glaucoma Treatment Study (CIGTS) or the Advanced Glaucoma Intervention Study (AGIS). These data were used to parameterize a Kalman filter and logistic regression in order to identify personalized indicators of glaucoma progression and to assess when glaucoma patients should next be tested. The Kalman filter is used to dynamically update our knowledge about each patient's disease dynamics as additional VF and IOP measurements are obtained. We then forecast each patient's dynamics into the future while incorporating the uncertainty associated with those forecasts. Logistic regression is used to model the relationship between the current and future disease dynamics and glaucoma progression. We developed a dynamic algorithm which combines the Kalman filter updating capabilities and the logistic regression predictive power to determine personalized schedules of VF and IOP testing. Our algorithm was compared against fixed interval schedules of obtaining VFs and IOP measurements from the trials.

Results: 571 patients met the inclusion criteria with a mean length of follow-up of 5.6 years. With over 27% increase of accuracy ($p<0.0001$), our scheduling algorithm leads to detecting glaucoma progression 63% sooner (i.e. reduced diagnostic delay) than following a yearly schedule ($p<0.0001$) without increasing the number of follow-up tests performed.

Discussion: Our algorithm for scheduling VF and IOP tests learns about each patient's unique disease progression dynamics over time using a Kalman filter, thereby enabling adjustment of decisions to the prognostic scenario of each patient.

Conclusions: Dynamic and personalized testing schedules improve the likelihood of detecting disease progression and lead to identification of progression earlier than fixed yearly intervals.

	Fixed Interval VF Testing (every year)	Algorithm on All Participants (CIGTS / AGIS)	Algorithm on CIGTS Participants	Algorithm on AGIS Participants
Number of Visual Field Tests per Patient	4.71	4.57	3.59	5.36
Accuracy at detecting glaucoma progression	0.55	0.82	0.74	0.86
Diagnostic delay (months)	2.38	1.47	1.50	1.44

New Concepts

21. Episcleral Venous Pressure in Untreated Open Angle Glaucoma

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Purpose: The contribution of episcleral venous pressure (EVP) to the elevation of intraocular pressure (IOP) in open angle glaucoma (OAG) is unknown. Previous studies of EVP in OAG have been contradictory.[1,2] In this study, we used a new automated venomanometer,[3] to investigate any difference in EVP between untreated OAG and normal individuals.

Methods: EVP was measured by using a computer controlled venomanometer in one eye each of 101 subjects with untreated OAG (mean age, 64 years; range 24 to 83 years) and 191 eyes of 100 healthy subjects (mean age, 48 years; range 19 to 81 years). The collapse of an episcleral vein during inflation of a transparent chamber applied to the vein was monitored in video images, and the pressure that just began to collapse the vein was assumed to be equal to the venous pressure. Descriptive statistics were calculated for IOP and EVP and differences between groups were examined by using generalized estimating equation models.

Results: IOP of normal eyes and eyes with OAG was 13.7 ± 3.0 mmHg (mean ± SD) and 27.4 ± 8.0 mmHg respectively ($p<0.001$). EVP of normal eyes and eyes with OAG was 6.9 ±1.9 mmHg and 7.7 ± 2.0 mmHg respectively ($p=0.003$). EVP was not correlated with age and IOP in either of the groups ($p>0.24$). Discussion: In OAG, mean IOP was about 14 mmHg greater than it was in normal subjects, although EVP was less than 1 mmHg greater. This elevation in EVP could contribute in a small part to the elevation of IOP but it is not likely to be a dominant determinant.

Conclusions: EVP in OAG patients is elevated compared with normal subjects. However, elevation of EVP is not a primary cause of IOP elevation in OAG.

References

1. Selbach JM, Posielek K, Steuhl KP, Kremmer S. Episcleral venous pressure in untreated primary open-angle and normal-tension glaucoma. Ophthalmologica. Nov-Dec 2005;219(6):357-361.
2. Podos SM, Minas TF, Macri FJ. A new instrument to measure episcleral venous pressure. Comparison of normal eyes and eyes with primary open-angle glaucoma. Arch Ophthalmol. Aug 1968;80(2):209-213.
3. Sit AJ, Ekdawi NS, Malihi M, McLaren JW. A novel method for computerized measurement of episcleral venous pressure in humans. Exp Eye Res. Jun 2011;92(6):537-544.

22. Association between Myopia and Glaucoma in a United States Population

MARY QIU, Sophia Wang, Kuldev Singh, Shan Lin.

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Purpose: To investigate the association between myopia and the prevalence of glaucoma.

Methods: This cross-sectional study included 5277 participants from the 2005-2008 National Health and Nutrition Examination Survey, ≥40 years old, without history of cataract or refractive surgery, who underwent auto-refraction measurement. The predictor was refractive status; emmetropia (-0.99 to +0.99D), mild myopia (-1.00 to -2.99D), moderate myopia (-3.00 to -5.99D), severe myopia (>6.00D), and hyperopia (>1.00D). The outcomes were self-reported glaucoma, vertical cup-to-disc ratio and visual field defects.

Results: Odds of self-reported glaucoma were not significantly increased in mild (OR 0.90, CI 0.56-1.45), moderate (OR 1.40, CI 0.62-3.16), or severe (OR 0.26, CI 0.08-0.80) myopes compared to emmetropes. Odds of vertical cup-to-disc ratio ≥0.7 were not significantly increased in mild (OR 0.84, CI 0.31-2.25), moderate (OR 0.37, CI 0.04-3.57), or severe (OR 0.85, CI 0.09-8.42) myopes compared to emmetropes. Odds of any visual field defects were significantly increased in mild (OR 2.02, CI 1.28-3.19), moderate (OR 3.09, CI 1.42-6.72) and severe (OR 14.43, CI 5.13-40.61) myopes compared to emmetropes. The χ^2 test indicated a significant difference ($p=0.001$) in the distribution of subjects with each category of visual field status across subjects with each refractive status; the proportion of subjects with worse visual field defects increased with worsening myopia severity.

Discussion: This study found an association between myopia and visual field defects, but failed to find an association between myopia and self-reported glaucoma or vertical cup-to-disc ratio. In subjects with mild, moderate, and severe myopia, the odds of having any visual field defect were increased approximately two-fold, three-fold, and thirteen-fold, respectively, compared to subjects with emmetropia.

Conclusions: The association between myopia and visual field defects may represent an increased risk of glaucoma among myopes, and the lack of association with self-reported glaucoma may suggest a need for greater glaucoma surveillance in this population.

23. Continuous 24-Hour Intraocular Pressure Patterns in Untreated Glaucoma Patients

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Purpose: To study circadian intraocular pressure (IOP) patterns and response to a water-drinking test (WDT) in untreated glaucoma patients.

Methods: Twenty-two patients with suspect or established glaucoma underwent continuous ambulatory monitoring of IOP patterns for 24 hours using a contact lens sensor (CLS; Triggerfish®, Sensimed AG, Switzerland) in one eye. The CLS provides its output in arbitrary units, (a.u.) corresponding to mV. After 24 hours, patients returned to the clinic and underwent a WDT (1 L of water in 5 minutes) during which the CLS monitoring continued for another 2 hours. In the fellow eye, IOP was measured using Goldmann applanation tonometry (GAT) at 15, 30, 45, and 120 minutes after the start of the WDT. To evaluate response to the WDT, linear regression slopes were constructed for both eyes from pre-WDT IOP measurements to two hours after WDT.

Results: Average age of patients was 63.8±11.8 years and 50% were male. In the CLS eye, positive linear slopes were seen at the transition from wake/sitting to sleep/supine (23.2±42.2 a.u.) and negative slopes after awakening/sitting (-16.7±68.6 a.u.). In comparison, slopes from pre-WDT to 15, 30, 45, and 120 minutes after WDT were 1.5±18.8 ($p=0.724$), 4.7±11.7 ($p=0.071$), 3.0±4.7 ($p=0.008$), and 3.4±3.8 a.u. ($p<0.001$) in the CLS eye and 6.1±4.9 ($p<0.001$), 4.7±4.2 ($p<0.001$), 2.6±2.7 ($p<0.001$), and -0.8±1.2 mmHg ($p=0.008$) in the GAT eye. Peak IOP was observed at 65.0±28.3 minutes after the start of the WDT in the CLS and 32.0±23.3 minutes in the GAT eye.

Discussion: There was a mean difference of 33 minutes in timing of peak IOP after WDT between CLS and GAT eyes. This discrepancy could be due to inter-eye differences, differences in measurement frequency and technique (continuous vs. static) and warrants further investigation.

Conclusions: IOP increased following the WDT in untreated glaucoma patients with peak pressures at 65 minutes in CLS eyes and 32 minutes in GAT eyes.

References (1-3)

1. Medeiros FA, Pinheiro A, Moura FC, Leal BC, Susanna R, Jr. Intraocular pressure fluctuations in medical versus surgically treated glaucomatous patients. J Ocul Pharmacol Ther. 2002 Dec;18(6):489-98.
2. Mansouri K, Medeiros FA, Tafreshi A, Weinreb RN. Continuous 24-Hour Monitoring of Intraocular Pressure Patterns With a Contact Lens Sensor: Safety, Tolerability, and Reproducibility in Patients With Glaucoma. Arch Ophthalmol. 2012 Aug 13:1-6.
3. Mansouri K, Shaarawy T. Continuous intraocular pressure monitoring with a wireless ocular telemetry sensor: initial clinical experience in patients with open angle glaucoma. Br J Ophthalmol. 2011 May;95(5):627-9.

24. Changes in Ocular Biometric Parameters over a 24 Hour Period in Ocular Hypertensive

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Purpose: The overall refractive status of the eye is determined by the corneal power, anterior chamber depth, lens thickness and axial length. Intraocular pressure has the potential to affect some of these parameters. Over a 24 hour period the changes in these parameters need to be complimentary to each other to keep the overall refractive error stable throughout the day. To determine the extent of the physical changes and whether they correlate with intraocular pressure (IOP), this study evaluates biometric parameters throughout a day and night in patients with ocular hypertension (OHT) treated with brimonidine or vehicle.

Methods: Thirty patients with OHT (58.6±9.2 years of age) were enrolled in this randomized, double-masked, crossover study. Participants self-administered 0.2% brimonidine or vehicle three times daily for 6 weeks. At the end of each 6 week period, measurements of habitual (seated during the day and supine at night) intraocular pressure (IOP), central cornea thickness (CCT), anterior chamber depth (ACD), axial length (AXL) and lens thickness were made at 8 AM, 3 PM, 8 PM and 3 AM. The results were compared by two-way ANOVA followed by one-way ANOVA and post hoc testing when appropriate. P values<0.05 were considered statistically significant.

Results: In the two-way ANOVA model, time of measurement had a significant effect on IOP, CCT, ACD and AXL. In vehicle-treated eyes, CCT was thicker at 3 AM than any other time ($p<0.01$), ACD and AXL were larger at 3 AM and 8 PM than 3 PM ($p<0.01$) and lens thickness did not change ($p=0.40$). Supine IOP at 3 AM was greater than seated IOP during the day ($p<0.01$). Brimonidine, with a mean habitual IOP decrease of 1.09 ± 3.72 mmHg during the day and 0.33 ± 4.33 mmHg during the night, did not alter any of these patterns. The shortest AXL and ACD were temporally close to the lowest IOP during the day.

Discussion: The increase in axial length at night (approximately 75 µ) can be attributed to an increase in anterior chamber depth (approximately 90-100 µ). The increase in anterior chamber depth is independent of any change in lens thickness. Brimonidine use does not alter the normal diurnal rhythm of ocular biometric parameters. A more potent ocular hypotensive drug may affect these rhythms and should be evaluated.

Conclusions: Numerous ocular biometric measurements exhibit 24 hour rhythms in patients with OHT. At night the supine IOP increases, the cornea becomes thicker, the anterior chamber depth increases and the axial length increases. These potentially IOP-mediated changes appear complimentary towards maintenance of refractive status of the eye, demonstrating inherent homeostatic mechanisms despite significant changes in the IOP throughout a 24 hour period.

25. A Nested Case Control Study of Plasma ICAM-1, E-selectin and TNF Receptor 2 Levels and Incident Primary Open-angle Glaucoma

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Purpose: An inverse association between body mass index (BMI) and primary open-angle glaucoma (POAG) among women but not men has been described in Nurses' Health Study (NHS) and Health Professional Follow-up Study (HPFS) participants and confirmed in the Rotterdam Study. We hypothesize that this association is mediated by tumor necrosis factor alpha (TNF-α), which shows differential relationships to BMI by gender.

Methods: We collected blood samples in 1989-1990 (NHS: all women) and 1993-1995 (HPFS: all men). We identified POAG cases occurring after blood draw (NHS: n=229; HPFS: n=116). Controls (NHS: n=461; HPFS: n=228) were matched on age, race, ethnicity, cancer status, and date of blood collection. Plasma concentrations of ICAM-1, E-selectin and sTNF-R2 were measured by an ELISA assay. Cohort-specific multivariable conditional logistic regression model results were pooled using meta-analytic methods.

Results: We observed no associations between ICAM-1 and E-selectin; however, we observed associations with sTNF-R2. Mean (SD) plasma levels (pg/mL) of sTNF-R2 in cases and controls were 2888 (997) and 2986 (912), respectively, in women and 2622 (664) and 2568 (688), respectively, in men. Pooled multivariable results showed no overall relation between sTNF-R2 levels and POAG. However, the results were significantly (p=0.01) heterogeneous between men and women: compared to the lowest tertile of sTNF-R2, the highest tertile showed a significant 43% decreased risk of POAG in women (multivariable odds ratio [OR]=0.58, 95% CI=0.36-0.94; p for trend=0.03) but not in men (OR=1.39; 95% CI=0.74-2.60; p for trend=0.21).

Discussion: Women with low BMI may have low intracranial pressure that disrupts the trans-lamina cribrosa pressure gradient in a manner similar to elevated IOP, triggering ocular production of TNF-α and retinal ganglion cell (RGC) loss. Serum levels sTNF-R2 may cross into the eye to bind TNF-α and thereby prevent glaucomatous optic neuropathy. Interestingly subcutaneous etanercept, a biologic agent that binds TNF-α, rescues RGCs in an experiment glaucoma model via this mechanism.

Conclusions: Women with POAG may benefit from therapy that modifies intraocular TNF-α levels.

Poster Schedule

THURSDAY, FEBRUARY 28

7:00 AM – 8:00 AM Moderated Poster Session (1-41) CME
7:00 AM – 5:00 PM Poster viewing (1-41)

FRIDAY, MARCH 1

7:00 AM – 8:00 AM Moderated Poster Session (42-74) CME
7:00 AM – 5:00 PM Poster viewing (42-74)

SATURDAY, MARCH 2

7:00 AM – 8:00 AM Moderated Poster Session (75-114) CME
7:00 AM – 3:30 PM Poster viewing (75-114)

THURSDAY, FEBRUARY 28

Poster #	*Author*	*Title*
Surgery		
1	Jonathan S. Myers, MD	Open Angle Glaucoma Treated with a Suprachoroidal Stent and Topical Travoprost
2	Thomas W. Samuelson, MD	Outcomes of Micro-invasive Glaucoma Surgery (MIGS) with Trabecular Micro-Bypass Stents and Prostaglandin in Open Angle Glaucoma Subjects
3	Jason Bacharach, MD	Suprachoroidal Stent and Cataract Surgery vs. Cataract Surgery only for Open Angle Glaucoma: Findings from a Prospective, Randomized, Controlled Multicenter Study
4	Marina Ramirez, MD	12 Month Results from a Prospective, Multicenter Study of a Schlemms Canal Microstent for IOP Reduction after Cataract Surgery in Open Angle Glaucoma.
5	Jeffrey R. SooHoo, MD	Pre-clinical Investigation of a Novel Dual Blade Device for Ab Interno Trabeculectomy
6	Hady Saheb, MD	One Year Outcomes of a Schlemms Canal Microstent for IOP Reduction after Cataract Surgery in Mild to Moderate Open Angle Glaucoma
7	Jeremy K. Jones, MD	Corneal Decompensation Following Glaucoma Drainage Device Implantation
8	Marc Toeteberg-Harms, MD	Case Controlled Comparison of Phacoemulsification (phaco) Combined with Ab Interno Trabeculectomy (AIT) (Trabectome), Phaco with Trabeculectomy, and Phaco Alone for the Management Cataract and Open-angle Glaucoma or Ocular Hypertension
9	Malik Y. Kahook, MD	Outcomes Following Implantation of Second Generation Stents in Subjects with Mild-Moderate Open Angle Glaucoma
10	Douglas J. Rhee, MD	Effectiveness of Subsequent Selective Laser Trabeculoplasty (SLT) after Failed Ab Interno Trabeculectomy with the Trabectome (AIT)
11	Crystal Hung, MD	Glaucoma Tube-Shunt Procedure in Patients with Uveal Melonoma Treated with I-125 Plaque Brachytherapy
12	Davinder S. Grover, MD, MPH	Clinical Safety and Efficacy of 360-Degree Gonioscopy Assisted Transluminal Trabeculotomy (GATT) for the Treatment of Eyes with Failed Glaucoma Surgery or Juvenile Glaucoma
13	Joseph T. Kim, MD	Combined Trabectome and Cataract Extraction versus Combined Trabeculectomy and Cataract Extraction in Open Angle Glaucoma

14	David G. Godfrey, MD	Clinical Safety and Efficacy of 360-Degree Gonioscopy Assisted Transluminal Trabeculotomy (GATT) for the Treatment of Glaucoma: Interim Outcomes of Primary Glaucomas.
15	Iqbal Ike K. Ahmed, MD	Combined Use of Two Trabecular Micro-Bypass Stents, One Suprachoroidal Stent and Travoprost in OAG Not Controlled by Trabeculectomy and Medication
16	Max C. Kim, MD	Incidence of Early Postoperative Bleb Leak, A Comparison of Closure Methods
17	Paul Harasymowycz, MD, FRCSC	Correlation between AS-OCT Findings and IOP after Deep Sclerectomy (DS) Augmented with a Gold Micro-shunt (GMS) Implant in the Suprachoroidal Space
18	Eun S. Huh, MD	Outcomes of Pars Plana Glaucoma Drainage Implant in Boston Type 1 Keratoprosthesis Surgery
19	Felix Gil-Carrasco, MD	Long-term Results in 912 Ahmed Implants Placed without a Patch Graft in Mexico
20	Evan Schoenberg, MD	Surgical Outcomes: Canaloplasty versus Trabeculectomy at 12 Months
21	Karim F. Damji, MD	Efficacy and Safety of Ab Interno Trabeculectomy with Trabectome in Juvenile Open Angle Glaucoma (JOAG)
22	Rodolfo A. Perez Grossmann, MD	Preliminary Results of the Trabeculectomy with Suprachoroidal Derivation
23	Jeff Wongskhaluang, MD	8-year Review: Efficacy and Complications of Resident Performed Trabeculectomies at a County Hospital
24	Kevin Kaplowitz, MD	Two Year Results for 180 Degree Trabectome Ablation
25	Mauricio Turati, MD	Second Ahmed Valve Implant in Mexican Patients with Refractory Glaucoma: Long-term Results
26	Sarwat Salim, MD	Comparison of Surgical Outcomes of the Ex-PRESS Glaucoma Filtration Device with Mitomycin C in Phakic and Pseudophakic Eyes
27	My Le Shaw, MD	Outcomes of Glaucoma Drainage Implants With and Without Mitomycin C in Aniridic Glaucoma
28	Lekha Ravindraraj, BS	Two-Year Outcome of Trabeculotomy and Goniotomy in Primary Congenital Glaucoma
29	Michael S. Berlin, MD	The IOP Lowering Efficacy of Combined Excimer-Laser-Trabeculostomy and Phacoemulsification in Glaucoma Patients Remains Consistent over 5 Years
30	Neha Sangal, MD	The Efficacy of Transscleral Diode Laser Cyclophotocoagulation on Lens Status
31	Garrick Chak, MD	Trabectome Outcome of Glaucoma Patients with Steroid Induced Glaucoma
32	Norman D. Baker, MD	Combined Vitrectomy with Gas Tamponade and Posterior Glaucoma Tube Placement in the Management of Complicated Uveitic Glaucoma
33	Peter W. DeBry, MD	Modified Baerveldt Implantation, a New Surgical Approach for the Treatment of Uncontrolled Eye Pressure in Eyes with no Previous Glaucoma Surgery
34	Masahiro Maeda, MD	Comparison of the Outcomes of Trabectome with Trabeculotomy with Deep Sclerectomy – Ab Interno vs. Ab Externo Approach
35	Linda Zhang, MD	Baerveldt-250-mm² Glaucoma Drainage Devices in Eyes with Preexisting Scleral Buckles
36	Adam Muzychuk, MD, BSc	S3 (Pediatric) Ahmed Valves for the Surgical Management of Glaucoma in Advanced Age
37	Robert J. Noecker, MD	Prospective, Randomized, Controlled Trial of Second Generation Trabecular Bypass Stents for Mild-moderate OAG
38	Adam C. Breunig, MD	Ex-press vs. Trabeculectomy
39	Shakeel R. Shareef, MD	Trans-Scleral Diode Cyclophotocoagulation (TDCPC) Scleral Burns within Areas of Peri-Limbal Conjunctival Melanosis
40	Michael Lee, BS	Glaucoma Tube Repositioning into Pars Plana for Refractory Malignant Glaucoma.
41	Anik Desgroseilliers, MD, FRCSC	One Year Outcomes of the Trabecular Micro-bypass Stent with Phacoemulsification and Risk Factors for Failure

FRIDAY, MARCH 1

Poster #	*Author*	*Title*
Imaging, IOP and Outflow		
42	Renato Lisboa, MD	Continuous Likelihood Ratios for Glaucoma Diagnosis Using Spectral Domain Optical Coherence Tomography
43	Camila F. Netto, MD	In Vivo Evaluation of Peripheral Laminar Deformation in Glaucoma Using EDI OCT and Algorithms for Shadow Removal and Contrast Enhancement
44	Bo Wang, BS	Three-dimensional Imaging of the Lamina Cribrosa to Assess Structure and Function in Glaucoma
45	Roland Y. Lee, BS	A Thinner Iris at Baseline Predicts Greater Changes in Iris Curvature and Anterior Chamber Dimensions after Prophylactic Laser Peripheral Iridotomy
46	Donna Nguyen, MD	Effect of Laser Peripheral Iridotomy on Trabecular-Irido Circumference Volume in Primary Angle Closure Eyes
47	Kouros Nouri-Mahdavi, MD, MSc	Optimizing Detection of Glaucoma with RNFL Measurements
48	Qi N. Cui, MD, PhD	Optic Disc Area Variations in Caucasian, Chinese, African, Hispanic, and Filipino Using Fundus Photography
49	Joanne C. Wen, MD	Artifacts in Spectral Domain Optical Coherence Tomography Imaging in Glaucoma
50	Nathan M. Radcliffe, MD	Flicker Chronoscopy: Agreement for Structural Glaucomatous Progression and Factors Associated with Progression
51	Richard Stodtmeister, MD	The Perfusion Pressure in the Prelaminar Layer of the Optic Disc May Be Decreased by an Enhanced Pressure in the Central Retinal Vein.
52	Alice L. Williams, MD	Correlation of Brain Volumes and Patient-Reported Visual Disability in Glaucoma
53	Ramesh S. Ayyala, MD	80 Mhz Iultrasound Imaging of Schlemms Canal and Angle in Pediatric Population With and Without Glaucoma
54	Oluwatosin U. Smith, MD	Ultrasound Biomicroscopy Findings after Supracilliary Shunt Placement in Patients with Glaucoma.
55	Karine D. Bojikian, MD	Optic Disc Hemorrhage after Phacoemulsification in Patients with Glaucoma
56	Vandana Minnal, MD	Posterior Vitreous Detachment Artifact on Retinal Nerve Fiber Layer Thickness Map
57	James C. Tan, MD, FRCOphth, PhD	3D Image Modeling of the Human Trabecular Meshwork
58	Rachel H. Lee, BS	Novel Corneal Biomechanical Parameters in Glaucoma Eyes versus Normal Eyes
59	Pradeep Y. Ramulu, MD, PhD	Determinants of Visual Field Reliability
60	Rene Goedkoop, MD	Dynamic Intraocular Pressure Pattern Following Postural Change from Sitting to Supine in Healthy Subjects
61	Oscar Batlle, MD	Is the Retrobulbar Space an Effective Compartment for Drainage of Aqueous Humor? Results from Animal and Human Studies.
62	Katrin Lorenz, FEBO	Contact Lens Sensor Is Well Tolerated During Continuous 24-hour Intraocular Pressure Pattern Recording
63	Haiyan Gong, MD, PhD	A Correlative Evaluation of Active Outflow Area and Morphology between Primary Open Angle Glaucoma and Normal Eyes
64	Molly M. Walsh, MD	The Impact of Severe Glaucoma on Aqueous Humor Outflow Facility after Cataract Surgery
65	Florentina J. Freiberg, MD	Continuous Intraocular Pressure Recording Using a Contact Lens Sensor Did Not Change Central Corneal Thickness
66	Sabita M. Ittoop, MD, MS	The Role of Central Corneal Thickness in Risk Stratification for Pigmentary Glaucoma
67	Sara Duke, BA, MD	A Prospective Trial Evaluating Scleral Rebound Tonometry

68	William E. Sponsel, MD	The Jigsaw Effect: Clinical Evidence for CNS Control of Chronic Glaucomatous Neurodegeneration
69	Rohini Rao, BA	Effect of Ancestry, as Based on Racial Identification, on Optic Nerve Head Parameters
70	Aiyin Chen, MD	Scleral Pressure Measurement Pre- and Post-Keratoprosthesis Implantation in Cadaver Eyes
71	Krishna Patel, BS	Correlation of Serum Calcium Levels to Primary Open Angle Glaucoma
72	Sayoko E. Moroi, MD, PhD	Association of Aqueous Humor Dynamic Markers in Glaucoma with Canaloplasty Surgery
73	Vipin Kuriachan, MD	The Initial Clinical Features of Primary Open Angle Glaucoma
74	Ronit Nesher, MD	Characterization of Prostaglandin F2α Receptors in Hair Follicles of Eyelids

SATURDAY, MARCH 2

Poster #	*Author*	*Title*
Glaucoma Management and Therapy		
75	Julia Song, MD	Selective Laser Trabeculoplasty Success in Pediatric Glaucoma Patients.
76	Eric Chang, BS	Argon Laser Trabeculoplasty (alt) by Residents: Predictors of Failure
77	Eugene Lowry, BA	Resident-Performed Selective Laser Trabeculoplasty in Open Angle Glaucoma Patients
78	Nathan Markel, BS	Selective Laser Trabeculoplasty (slt): Predictors of Failure
79	Julius T. Oatts, BSC	Post-Procedure Intraocular Pressure of Titanium-Sapphire Laser Compared to Standard Selective Trabeculoplasty
80	Jae H. Kang, DSC	The Relation between Iron Supplement Use and Risk of Primary Open-angle Glaucoma: Results from Two Prospective Cohorts
81	Helen Koenigsman, MD	Glaucoma Treatment Compliance Assessment Tool as a Predictive Tool for Medication Adherence
82	Richard A. Lewis, MD	A 7-day Clinical Study to Assess the IOP Lowering of a Novel ROCK/PGA Fixed Dose Combination in Patients with Open-angle Glaucoma and Ocular Hypertension
83	Henry D. Jampel, MD, MHS	Effectiveness of Adjuvant Topical Medication in Lowering Intraocular Pressure
84	Joseph F. Panarelli, MD	Clinical Impact of Eight Prospective, Randomized, Multicenter Glaucoma Trials
85	Gary D. Novack, PhD	First-In-Human Clinical Study of a Novel Dual Mechanism Compound (AR-13324) for the Lowering of IOP in Glaucoma and Ocular Hypertension
86	Cindy Ung, BA	Glaucoma Severity and Medication Adherence in a County Hospital Population
87	Thasarat S. Vajaranant, MD	The Long-term Effect of High-dose Antioxidants on Intraocular Pressure in the Age-related Eye Disease Study (AREDS)
88	Cindy M. Hutnik, MD, PhD, FRCSC	The Effects of Benzalkonium Chloride and Tafluprost on Human Trabecular Meshwork Cells
89	Albert S. Khouri, MD	Feasibility of Telepresence in Glaucoma Care
90	Christopher J. Ricks, BS	Bacterial Contamination of Preservative-free Eye Drops in Single-use Vials ofTalfluprost
91	Jess T. Whitson, MD	Phase 3 Randomized 3-month Trial with an Ongoing 3-month Safety Extension of Fixed-combination Brinzolamide 1%/brimonidine 0.2%
92	Osamah J. Saeedi, MD	Potential Role E-mail and Text Messaging in Improving Adherence?
93	Nakul S. Shekhawat, MD	Regional and Physician-level Variation in Rates of Laser Trabeculoplasty in the Medicare Population
94	NaYoung Lee, MPH, MSt	Evaluation of Self-Administration of Eye Drops among Glaucoma Patients in Ghana

95	Gail F. Schwartz, MD	Evaluation of IOP-lowering Ophthalmic Drop Administration Technique
96	Iryna A. Falkenstein, MD	Effects of Subconjuctival Triamcinolone Acetonide on IOP after Ahmed Glaucoma Valve Implantation in Patients with Uveitis.
97	Vikas Gulati, MD	Study of Effect of Topical Anesthetics on Intraocular Pressure Measured by Rebound Tonometry in Human Volunteers
98	Vaishali D. Patel, PharmD, MS	Adherence and Persistence on Bimatoprost 0.01% versus Bimatoprost 0.03%
99	Victoria Leung, BA	To Investigate the Relationship between Socio-demographic Factors and Non-persistence with Topical Glaucoma Medications
100	Jonathan Tzu, MD	Quality of Life in Veterans Using Glaucoma Drops: Health Care Disparities
101	Jennifer Calafati, MD	Frequency of Intervention in Stable Glaucoma Patients
102	Sourabh Arora, BSC, MD	Improving Access and Cycle Time through a Hospital Based Tele-glaucoma Program
103	Mehul H. Nagarsheth, MD	A Comparison between Subconjunctival Mitomycin C Injection and Topical Application of Mitomycin C-soaked Sponges Used in Glaucoma Filtration Surgery
104	Anjali Parekh, MD	Clinical Applicability of the Glaucoma Staging Codes to Predict Disease Severity in Patients with Open Angle Glaucoma
105	Jason Cheng, FCOphth, MBBS, MRCOphth	Quality of Referral Letters to a Tertiary Glaucoma Unit- Adherence to the Glaucoma Guidelines
106	Jacob T. Wilensky, MD	Impact of Generic Medications on the Cash Cost of Antiglaucoma Medications
107	Melissa O. Ajunwa, MD	Effect of Glaucoma Educational Videos on a Glaucoma Patient's Knowledge Regarding Glaucoma and Glaucoma Treatments.
108	Jeremy C. Hwang, MD, PhD	Methyl-Sulfonyl-Methane (MSM)-Induced Acute Angle Closure: A Case Report
109	Charlotte E. Joslin, OD, PhD	The Association between Vitamin D Nutrient Density and Baseline Intraocular Pressure in the Age-Related Eye Disease Study (AREDS).
110	Paula Anne Newman-Casey, MD	An Evaluation of Non-Physician Educators in Enhancing Patient's Surgical Knowledge and Satisfaction
111	Elena Bitrian, MD	Glaucoma in Stevens-Johnson Syndrome
112	Ako Takakura, MD, MPH	What Patients Know about Glaucoma: Identifying Gaps in Knowledge
113	Yao Liu, MD	Data Mining a Health System EMR: Is Glaucoma a Sick Eye in a Sick Body?
114	Anna L. Silverman, BA	The Safety of Oral Carbonic Anhydrase Inhibitors in Patients with a History of Sulfa Allergy

Poster Abstracts
Thursday, February 28, 2013

Surgery

1. Open Angle Glaucoma Treated with a Suprachoroidal Stent and Topical Travoprost

JONATHAN S. MYERS, L. Jay Katz.
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Purpose: Outcomes following ab interno implantation of a suprachoroidal stent in conjunction with postoperative travoprost were assessed in open angle glaucoma (OAG) phakic subjects with IOP previously not controlled on two topical hypotensive medications.

Methods: A suprachoroidal stent (iStent supra, Glaukos) was designed to improve aqueous outflow and reduce IOP in moderate to advanced OAG by using the uveoscleral outflow pathway. A previous report showed significant reduction of IOP and medication burden through six months. In this study, stent implantation was achieved via a 1 mm temporal clear corneal incision under topical anesthesia in 30 phakic eyes with IOP 18 mmHg - 30 mmHg on two medications and no history of incisional or laser surgery. Preoperative IOP after medication washout was required to be between 22 mmHg and 38 mmHg. Travoprost added to all eyes postoperatively and stopped if IOP < 6 mmHg. Postoperative evaluations occurred at Day 1, Week 1, and Months 1, 3, 6, 12, 13, 18, 24 and 25. IOP without medication after washout is planned at 13 and 25 months.

Results: All subjects underwent uncomplicated stent implantation, and a cohort of 25 eyes has been followed through 12 months. Mean IOP in this cohort was 19.7 ± 1.4 mmHg on two medications preoperatively (of which 18/25 were on a prostaglandin), 24.9 ± 1.5 mmHg after medication washout, and 13.8 ±1.8 mmHg or less throughout the first year postoperatively. At 12 months, 24 of 25 eyes experienced IOP reduction ≥ 20% vs. preoperative unmedicated IOP; 21 of 25 eyes experienced IOP reduction ≥ 20% vs. preoperative medicated IOP. All eyes reported with reduction of one medication. Transient hypotony (IOP = 5 mmHg) observed in two eyes at one week had resolved by one month; choroidal detachment in one of these eyes resolved by three months. BCVA improved or maintained from preoperative BCVA in all subjects.

Discussion: Following stent implantation, IOP and medication burden were significantly lowered in the absence of significant adverse events. Updated data from a larger series of subjects will be presented.

Conclusions: Findings to date suggest that implantation of a suprachoroidal stent is feasible, safe and capable of significant reduction in IOP and medication burden in phakic OAG subjects previously uncontrolled on two topical hypotensive medications.

References

1. Alm A. Uveoscleral outflow. Eye. 2000;14:488-491.
2. Vold S, et al. Open Angle Glaucoma Treated with a Suprachoroidal Stent and Topical Travoprost. Poster presentation at the 2012 AGS annual meeting, New York, NY, March 2012.

2. Outcomes of Micro-invasive Glaucoma Surgery (MIGS) with Trabecular Micro-Bypass Stents and Prostaglandin in Open Angle Glaucoma Subjects

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Introduction: Micro-invasive glaucoma surgery (MIGS) to implant single or multiple trabecular micro-bypass stents during cataract surgery has been shown to provide significant reduction of IOP and ocular hypotensive medication burden through two years postoperative.[1,2,3] This prospective study by the MIGS study group assessed implantation of two stents as the sole surgical procedure and use of one postoperative medication in OAG previously not controlled with two medications.

Methods: A total of 42 phakic or pseudophakic subjects on two ocular hypotensive medications, with medicated IOP ≥ 18 mmHg and ≤ 30 mmHg, and unmedicated (post-washout) IOP ≥ 22 mmHg and ≤ 38 mmHg were enrolled. Subjects received two stents (Glaukos) through a 1 mm clear corneal incision. Travoprost was prescribed postoperatively. Clinical parameters through 25 months included diurnal IOP, fundus/optic nerve exam, slit-lamp, gonioscopy, surgical/postoperative complications and best corrected visual acuity.

Results: Average age was 64 ± 12 years; 86% of eyes were phakic; 62% had C/D ratio 0.7 or worse. Mean IOP was 22.3 ± 2.5 mmHg before medication washout, and 25.1 ± 1.9 mmHg after washout. Transient hypotony at one week in one subject resolved without intervention or further sequelae by one month. No other subjects presented with complications. At Month 12, all eyes achieved a ≥ 20% IOP reduction vs. baseline with reduction of one medication; 62% achieved a ≥ 40% IOP reduction. All subjects achieved Month 12 IOP ≤ 18 mmHg; 81% achieved IOP ≤ 15 mmHg.

Discussion: In this study, significant IOP and medication reduction through 12 months postoperative was achieved.

Conclusions: Implantation of two trabecular bypass stents with one postoperative medication in phakic or pseudophakic OAG subjects not controlled on two medications provided IOP control with significantly reduced medication burden through 12 months postoperative.

References

1. Samuelson TW, Katz LJ, Wells JM, et al. Randomized evaluation of the trabecular micro-bypass stent with phacoemulsification in patients with glaucoma and cataract. Ophthalmology 2011;118:459-467.
2. Craven ER, Katz LJ, Wells JM, Giamporcaro JE. Cataract surgery with trabecular micro-bypass stent implantation in patients with mild-to-moderate open-angle glaucoma and cataract: Two-year follow-up. J Cataract Refract Surg 2012;38:1339-1345.
3. Belovay G, Naqi A, Chan B, Rateb M, MD, Ahmed I. Using multiple trabecular micro-bypass stents in cataract patients to treat open-angle glaucoma. J Cataract Refract Surg 2012; http://dx.doi.org/10.1016/j.jcrs.2012.07.017.

3. Suprachoroidal Stent and Cataract Surgery versus Cataract Surgery Only for Open Angle Glaucoma: Findings from a Prospective, Randomized, Controlled Multicenter Study

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Introduction: A prospective, randomized, controlled, multicentered U.S. IDE study of a suprachoroidal stent (iStent *supra*) is underway. This paper will report efficacy and safety of the iStent supra implanted during cataract surgery vs. cataract surgery alone in subjects with mild to moderate open angle glaucoma (OAG) and cataract requiring surgery.

Methods: The iStent *supra* (Glaukos) was designed to utilize the uveoscleral outflow pathway in which aqueous flows into intracellular spaces in the ciliary muscle and through supraciliary and suprachoroidal spaces.[1] The stent creates a patent lumen from the anterior chamber into the suprachoroidal space to enhance outflow and reduce IOP. Data from a previous study showed reduction of one medication and a ≥ 20% IOP reduction from preoperative unmedicated IOP six months after stent implantation as the sole procedure in phakic/pseudophakic eyes with OAG not controlled on two medications.[2] In this current study of mild to moderate OAG, subjects presented with IOP ≤ 24 mmHg on 1-3 medications and clinically significant cataract requiring surgery. Subjects were qualified if IOP after medication washout was between 21 mmHg and 36 mmHg and was 3 mmHg higher than medicated IOP. After successful cataract surgery, subjects were randomized 2:1 to cataract surgery with implantation of an iStent *supra* (treatment group) or cataract surgery only (control) with follow-up through 24 months.

Results: To date, 21 subjects have undergone surgery. Preoperative mean IOP was 17.9 ± 4.1 mmHg on an average of two medications and 23.2 ± 2.2 mmHg after medication washout. Last reported IOP was 13.5 ± 4.5 mmHg in the treatment group and 19.0 ± 8.5 mmHg in the control group. No intraoperative adverse events were reported. Two postoperative adverse events of IOP ≥ 10 mmHg vs. baseline occurred in the control group.

Discussion: Early data from initial subjects show substantial IOP decrease with no early untoward safety events.

Conclusions: Early findings support the continued subject enrollment and follow-up in this U.S. IDE study of a suprachoroidal stent in OAG. The author's experience as an investigator in this clinical trial will be included in the presentation.

References

1. Alm A. Uveoscleral outflow. Eye. 2000;14:488-491.
2. Vold S, et al. Open Angle Glaucoma Treated with a Suprachoroidal Stent and Topical Travoprost. Poster presentation at the 2012 AGS annual meeting, New York, NY, March 2012.

4. 12 Month Results from a Prospective, Multicenter Study of a Schlemm's Canal Microstent for IOP Reduction after Cataract Surgery in Open Angle Glaucoma

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Introduction: To evaluate the safety and effectiveness of a novel implantable device for the treatment of open angle glaucoma (OAG) with concurrent cataract surgery.

Methods: This is a prospective, multicenter, single arm clinical evaluation of an Schlemm's canal (SC) scaffold (Hydrus™ Microstent, Irvine, CA) in patients with mild to moderate OAG and coexistent cataract. The study device was placed into SC via an *ab interno* approach under gonioscopic guidance following phacoemulsification and intraocular lens placement. Follow up visits were on days 1 and 7 as well as 1, 3, 6 and 12 months postoperative. Study eyes were evaluated at each follow up visit for IOP (Goldmann tonometry), medication usage, and changes in visual status. Medication wash out was conducted at 12 month in subjects for whom it was deemed safe by the investigator to obtain an IOP without the influence of topical hypotensive medications.

Results: Twenty-nine eyes of 29 patients were recruited for the study and the microstent was successfully implanted in all subjects. Mean (±s.d.) age was 70.9±6.5; average mean deviation(MD) on automated perimetry was -4.5 ± 4.6 dB. Baseline mean IOP was 21.1 ± 5.6 mmHg on 2.2±1.4 glaucoma medications. At 1, 3, 6 and 12 months postoperatively, mean IOP was 15.9 ± 3.2, 14.8 ± 4.0, and 15.9 ± 3.5, and 16.9± 3.7 mmHg on a mean of 0.3 ± 0.8, 0.2 ± 0.6, 0.2 ± 0.7, and 0.1 ± 0.4 glaucoma medications respectively. All 29 subjects completed each follow up visit. After 12 month medication wash out, mean IOP reduction was 8.7 ± 4.3 mmHg ($P<0.001$) as compared to baseline. Surgical complications were minor and transitory.

Discussion: This Schlemm's canal scaffold lowers IOP without significant complications when used adjunctively with cataract surgery. The relative contributions of cataract removal versus device implantations in terms of IOP lowering cannot be determined from this study design.

Conclusions: This study shows that a Schlemm's canal microstent offers significant IOP reduction for at least 1 year following phacoemulsification in patients with mild to moderate open angle glaucoma. The proportion of IOP reduction due to the device compared to phacoemulsification alone requires further study.

5. Pre-clinical Investigation of a Novel Dual Blade Device for Ab Interno Trabeculectomy

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Purpose: To evaluate the pre-clinical effects of a novel device for ab interno trabeculectomy.

Methods: Three different instruments were used to incise the trabecular meshwork (TM) from human cadaveric corneal rim tissue: (1) Novel dual blade device, (2) microvitreoretinal (MVR) blade (BD, Franklin Lakes, NJ), and (3) Trabectome (Neomedix, Tustin, CA). The tissue samples then underwent histological processing and analysis. The intraocular pressure (IOP)-lowering effects of each device were also investigated using a human eye perfusion model. The pre- and post-procedure IOP was recorded for each device and compared using student paired t-tests. A p-value <0.05 was considered statistically significant.

Results: The dual blade device achieved more complete removal of TM without significant injury to surrounding tissues. The MVR blade exhibited minimal removal of TM with obvious injury to the adjacent sclera. While the Trabectome did remove a significant amount of TM, residual tissue and thermal injury were noted in all samples. Each device achieved a statistically significant decrease in IOP in the human eye perfusion studies, without a significant difference between devices.

Discussion: This study investigates the initial pre-clinical use of a novel dual blade device to remove TM tissue as a potential treatment for glaucoma. In contrast to the other devices, the dual blade device was able to achieve a more complete removal of TM with minimal damage to adjacent tissue. The lack of residual TM leaflets and decrease in collateral tissue damage may improve long-term aqueous outflow after the procedure. Treatment with the dual blade device also led to statistically significant IOP-lowering in a human eye perfusion model that was comparable to the other devices. It is unclear how these results will translate into long-term surgical outcomes.

Conclusions: Pre-clinical analysis of the dual blade for ab interno trabeculectomy suggests that it may be a useful device for the treatment of glaucoma. Future clinical studies are needed to guide the development and use of this novel device.

6. One Year Outcomes of a Schlemm's Canal Microstent for IOP Reduction after Cataract Surgery in Mild to Moderate Open Angle Glaucoma

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Introduction: To evaluate the 12 month intraocular pressure (IOP) reduction in patients with mild to moderate open angle glaucoma (OAG) following the implantation of an ab interno intracanalicular scaffold (Hydrus™ Aqueous Implant, Irvine, CA).

Methods: This is a single center pilot study in patients with mild to moderate OAG (based on Hodapp-Anderson-Parrish classification) and concurrent cataract. Study subjects were washed out of all hypotensive medications prior to surgery. The study device was placed into Schlemm's canal via an ab interno approach following phacoemulsification and intraocular lens placement. Follow up was conducted at 1 day, 7 days, and 1, 3, 6 and 12 months postoperatively. Study eyes were evaluated at follow up for IOP, medication use, and changes in visual status.

Results: 29 eyes from 27 patients were recruited into the study. The Schlemm's microstent was successfully implanted in 29/29 attempts. Mean (±sd) age was 73.9 ± 9.5; average Humphrey MD was -6.9 ± 4.2 dB. Baseline mean IOP was 17.9 ± 4.11 mmHg on an average of 2.39 ± 0.99 glaucoma medications, and washed-out IOP was 29.9 ± 5.76 mmHg on the day of surgery. Post operatively, adverse events included 1 subconjunctival hemorrhage, 1 hyphema, and 2 peripheral anterior synechiae. At 1, 3, 6 and 12 months follow up, IOP (N) was 17.19 ± 3.43 (27), 15.83 ± 3.26 (27), 15.27 ± 2.29 (26), and 16.5 ± 2.88 (24) mmHg on a mean of 0.48 ± 0.95, 0.19 ± 0.60, 0.13 ± 0.35, and 0.58 ± 1.05 glaucoma medications, respectively. At 12 months follow up, 19/24 patients completing follow up were medication free.

Discussion: Gonioscopically guided ab interno placement of the microstent is a straightforward and safe addition to standard phacoemulsification. In combination with phacoemulsification, the treatment was associated with reductions in IOP and medication use, and in a majority of cases medications could be stopped completely through 1 year post operative. Further studies are warranted to establish the relative contributions of the device and the phaco to IOP reduction.

Conclusions: An intracanalicular scaffold was safely and successfully implanted after cataract surgery in 29/29 mild to moderate OAG eyes. At 12 months follow up, IOP and medication use were reduced.

7. Corneal Decompensation Following Glaucoma Drainage Device Implantation

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Purpose: To identify risk factors for corneal decompensation following implantation of a glaucoma drainage device (GDD).

Methods: A retrospective chart review of 763 GDD implanted at Emory between 2000 and 2010. There were 702 primary GDD and 61 sequential GDD. Of the 702 cases with primary GDD, 46 had preexisting corneal decompensation and were excluded from analysis. Clinical and demographic variables were analyzed as potential risk factors for corneal failure.

Results: 656 patients with primary glaucoma drainage devices were included in the data analysis. There were a total of 73 patients (11.1%) with corneal failure and 583 patients (88.9%) without corneal failure. The average follow up for patients with corneal failure was 61.6 months and the average follow up in those without was 30.8 months. Of the preoperative diagnoses examined, only preexisting corneal disease was found to be a significant risk factor for corneal failure. In this group, the rate of corneal failure was 23.5%. The incidence of corneal failure was 5.8% in those with less than 2 prior procedures and 18% in those with 2 or more procedures. Prior penetrating keratoplasty was a significant risk factor for corneal failure. The incidence of corneal failure was 39.4% in those with a history of PKP and 7.4% in those without. Postoperative complications including flat anterior chamber, serous and hemorrhagic choroidals were significantly more likely to proceed to corneal failure, while shallow anterior chamber and hyphema were not.

Discussion: In this series, the incidence of corneal failure following GDD implantation with 11.1%. There was a significantly higher incidence of corneal failure in patients with preexisting corneal disease. Patients with a history of penetrating keratoplasty and multiple procedures, had a significantly higher incidence of corneal failure. Additionally, the incidence of corneal failure was higher in patients with postoperative complications such as flat anterior chamber, and serous or hemorrhagic choroidals.

Conclusion: Corneal failure continues to be a major cause of surgical morbidity following GDD implantation. Understanding preoperative characteristics that are associated with corneal failure allows the clinician to more accurately set patient expectations. Prompt diagnosis and treatment of postoperative complications associated with corneal failure could help reduce the incidence of corneal failure. This preliminary data could help shape prospective studies that assess the health of the cornea before and after GDD implantation.

8. Case Controlled Comparison of Phacoemulsification (phaco) Combined with Ab Interno Trabeculectomy (AIT) (Trabectome), Phaco with Trabeculectomy, and Phaco Alone for the Management Cataract and Open-angle Glaucoma or Ocular Hypertension

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Introduction: Eyes with either open-angle glaucoma or ocular hypertension frequently develop cataracts. We evaluated the use of phaco, phaco+AIT, and phaco+trabeculectomy in this population. We hypothesized that 1) the IOP reduction of phaco-trab would be greater than phaco and phaco-AIT, 2) phaco-AIT has a lower complication rate than phaco-trab, and 3) phaco-AIT and phaco-trab would have lower rate of acute IOP elevations (IOP spikes).

Methods: This is a retrospective case-controlled comparative series. Exclusion criterion was previous incisional glaucoma surgery. Eyes underwent phaco if their IOP was controlled on 2 or less anti-glaucoma medications (AGMs). Eyes received concurrent filtration surgery if their IOP is controlled but requiring ≥3 AGMs or their IOP is not within the target range. Primary outcome measures were IOP and Kaplan-Meier survival. Multiple definitions of failure were used, but the primary definition was IOP >21mmHg or <20% reduction below baseline after 1 month. Secondary outcome measures were number of anti-glaucoma medications and occurrence of complications; IOP spikes were defined as an elevation >20% over baseline).

Results: 121 eyes underwent phaco, 50 phaco-trab, and 156 phaco-AIT. There were no differences in baseline characteristics. IOP in the phaco group was lower up to 3.5y (P=0.008) and for the phaco-AIT up to 3y (P=0.032), and during the entire follow-up period of 6.5y for the phaco-trabs (P=0.020). IOP reduction was highest in the phaco-trab and lowest in the phaco group. Medications could be reduced in all groups as well. Besides that, severity and number of complications were higher in the phaco-trab group. Kaplan-Meier survival analysis shows comparable outcomes for all three procedures regardless of definition of failure up to 2y. After 2y, phaco-trab had a greater success rate compared to the phaco and phaco-AIT. Survival time varied between 28.2 and 33.7m for phaco, between 41.6 and 45.5m for the phaco-trab, and between 22.4 and 26.6m for the phaco-AIT, respectively. IOP spikes occurred in each group within 1m after surgery in 21.5 % in the phaco group, 44.7% in the phaco-trab and 8.9% in the phaco-AIT group, respectively. Most IOP spikes were less than 20mmHg.

Discussion: Our data demonstrate that our algorithm is effective. Phaco-trab had a greater success rate and longer survival time with lower mean IOP. In the first two years the phaco-trab and phaco-AIT are equally effective with highest rate of early complications in the phaco-trab group.

Conclusions: Phaco-AIT is reasonable to consider besides phaco-trab.

9. Outcomes Following Implantation of Second Generation Stents in Subjects with Mild-Moderate Open Angle Glaucoma

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Purpose: To describe outcomes one year after implantation of second generation trabecular micro-bypass stents as the sole procedure in patients with OAG.

Methods: A recent study initiated in March, 2011 by the Micro-Invasive Glaucoma Surgery (MIGS) Study Group (S.V. Malayan Ophthalmological Center, Yerevan, Armenia) evaluated implantation of two ab interno second generation stents (Model GTS400, iStent inject, Glaukos) stents, as the sole procedure, in 60 phakic eyes with OAG and IOP not controlled on one ocular hypotensive medication. Inclusion criteria also included C/D ratio ≤ 0.8, medicated IOP 18 - 30 mmHg, IOP 21 - 36 mmHg after medication washout, and ability to undergo a 25-month follow-up period. The iStent inject, a heparin-coated titanium stent, is implanted in Schlemm's canal using the G2-M-IS injector. This injector was designed to deliver two GTS400 stents using one insertion instrument through a clear corneal incision.

Results: Sixty phakic eyes underwent uncomplicated implantation of two GTS400 stents using the G2-M-IS injector. Mean preoperative IOP was 20.9 ± 1.0 mmHg on 1 medication and 25.2 mmHg after preoperative medication washout. In 59 eyes followed through 12 months, IOP was 14.1 ± 1.7 mmHg without medication. No adverse events were reported.

Discussion: Data through one year following GTS400 stent implantation were consistent with prior experience using this device and showed significant postoperative decrease in IOP and medications with a favorable safety outcome.[1,2] Follow-up is ongoing.

Conclusions: These data support the continued evaluation of safety and efficacy of the GTS400 stent implantation. This presentation will include updated data and the author's personal experience.

References

1. Bahler C, Hann C, Fjield T, et al. Second-generation Trabecular Meshwork Bypass Stent (iStent inject) Increases Outflow Facility in Cultured Human Anterior Segments. Am J Ophthal 2012;153:1206-1213.
2. Bacharach J, et al. Results Through Two Years Postoperative From Prospective, Randomized Studies of Second Generation Stents and Cataract Surgery in Mild-Moderate Open-Angle Glaucoma. Poster presentation at the 2012 AGS annual meeting, New York, NY, March 2012.

10. Effectiveness of Subsequent Selective Laser Trabeculoplasty (SLT) after Failed Ab Interno Trabeculectomy with the Trabectome (AIT)

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Introduction: When AIT failed the next surgical step in managing glaucoma would be conventional trabeculectomy. Because of all its disadvantages there is the desire to try other less invasive procedures first. SLT has proven its effectiveness to lower intraocular pressure (IOP). The aim of this study was to evaluate if SLT is still able to lower IOP even if 30-60° of the trabecular meshwork (TM) have been ablated by prior AIT.

Methods: SLT have been performed on patients after failed AIT (IOP >21mmHg, progression of visual field damage, or cupping). During follow-up success was evaluated as defined by reduction of IOP of >3mmHg and 20% and number of anti-glaucoma drugs ≤ baseline).

Results: 14 eyes (9 female, 4 right eyes) have been included. Mean age was 72.9±9.1years. Time to SLT after AIT due to non-success was 22.8±13.4month. Mean follow-up after SLT was 8.2±8.3month. SLT was successful in 35.7% of the cases. Time to non-success of SLT after failed AIT was 2.9±1.8month.

Discussion: SLT is able to lower IOP even after failed AIT. The success rate is low compared to SLT as a primary procedure. This is probably due to the fact that only the remaining TM can be treated by subsequent SLT and is accessible for drainage of aqueous humor. Non-success of SLT after failed AIT occurs usually within in the first three month after the procedure.

Conclusions: SLT is still an option to manage insufficient controlled IOP even after failed AIT especially because of its low risk profile. Nevertheless, the expectation of a successful intervention with a long-lasting effect to lower IOP should not be very high. In times of increased cost pressure of the health system early trabeculectomy is most likely the better option to manage glaucoma after failed AIT.

References

JR Samples, K Singh, SC Lin et al. (2011): Laser trabeculoplasty for open-angle glaucoma: a report by the american academy of ophthalmology. Ophthalmology. 118(11):2296-302.

N Prasad, S Murthy, JJ Dagianis, MA Latina (2009): A comparison of the intervisit intraocular pressure fluctuation after 180 and 360 degrees of selective laser trabeculoplasty (SLT) as a primary therapy in primary open angle glaucoma and ocular hypertension. J Glaucoma. 18(2):157-60.

MA Latina, SA Sibayan, DH Shin et al. (1998): G.Q-switched 532-nm Nd:YAG laser trabeculoplasty (selective laser trabeculoplasty): a multicenter, pilot, clinical study. Ophthalmology. 105(11):2082-8.

11. Glaucoma Tube-Shunt Procedure in Patients with Uveal Melonoma Treated with I-125 Plaque Brachytherapy

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Introduction: Patients with uveal melanoma may develop increased intraocular pressure (IOP) after brachytherapy. There is a lack of consensus regarding optimal management of glaucoma when the IOP cannot be controlled on maximal medical therapy (MMT), because of concern that glaucoma surgery may facilitate extraocular metastasis. We present the outcomes of glaucoma tube-shunt procedure in patients with I-125 plaque brachytherapy for uveal melanoma at our center.

Methods: A retrospective chart review was conducted on 341 patients who underwent brachytherapy for uveal melanoma between 2005 and 2011 by a single surgeon (TAM). Patients who underwent primary enucleation per COMS recommendations (23) and who had known metastases at the time of diagnosis (2) were excluded. Seven patients had medically uncontrolled IOP after local tumor control was achieved. Patients who had glaucoma tube shunt procedure were reviewed.

Results: Five patients received a glaucoma tube-shunt procedure for medically uncontrolled IOP elevation (mean: 35.4+/-10.9 mmHg, range: 25-52 mmHg) after undergoing brachytherapy. Melanoma diagnoses were iris melanoma (1), ciliary body melanoma (1), and choroidal melanoma (3) with no known monosomy 3 tumors. Glaucoma diagnoses were neovascular (3), angle closure (1), and open angle (1). None had pre-existing glaucoma. The time from brachytherapy to tube-shunt procedure (+ cataract surgery in 2 cases) ranged from 2 to 49 months. Follow-up after tube-shunt procedure ranged from 3 to 21 months. The mean post-op IOP was 16.0+/-6.6 mmHg (p=0.017, range: 9-23 mmHg). No patient lost vision as a result of the tube-shunt procedure, and 1 patient gained vision. At final follow-up, none of the patients demonstrated extraocular tumor extension or systemic metastasis.

Discussion: Secondary glaucoma after I-125 brachytherapy may be difficult to control with medical therapy alone. There is evidence that micrometastasis prior to diagnosis, and that the molecular profile of the tumor, such as monosomy 3, 6p gain, or gene expression profile class, determines the metastatic potential. Fine-needle aspiration biopsy routinely performed at the time of treatment for prognostication has not been shown to increase ocular or systemic dissemination at our center. Furthermore, cataract surgery and vitrectomy, performed after tumor treatment, demonstrate no increased risk of metastasis. Glaucoma tube-shunt may offer consistent IOP-lowering effect with minimal side effects when post-brachytherapy glaucoma is not adequately managed with MMT.

Conclusion: In patients who have undergone successful treatment of uveal melanoma with a low cytogenetic risk for metastasis, short-term follow-up after glaucoma tube shunt surgery does not demonstrate extraocular extension or metastasis. Further study of glaucoma surgery in treated uveal melanoma patients is warranted.

12. Clinical Safety and Efficacy of 360-Degree Gonioscopy Assisted Transluminal Trabeculotomy (GATT) for the Treatment of Eyes with Failed Glaucoma Surgery or Juvenile Glaucoma

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Purpose: To introduce a novel technique for 360-degree ab interno transluminal trabeculotomy in eyes with limited treatment options and in juvenile glaucoma. Additionally, to investigate the IOP lowering effect, risk profile, and postoperative complications of this technique.

Methods: A retrospective, IRB-approved chart review at Glaucoma Associates of Texas analyzed data through 12 months on 19 eyes with prior glaucoma surgery or with juvenile glaucoma. Intraocular pressure (IOP), number of IOP lowering medications, visual acuity, complications, and secondary procedures were recorded.

Results: A 360-degree trabeculotomy was performed in 13 of 13 eyes having 16 prior incisional glaucoma surgeries and in 5 (83.3%) of 6 eyes with juvenile glaucoma. The pre-operative mean (SD) IOP in eyes with prior glaucoma surgery (n=13) was 26.7 (7.0) mmHg on 3.0 (1.1) medications at baseline, decreasing to 14.3 (3.1) mmHg on 1.8 (0.8) medications at 6 months. Eyes with juvenile glaucoma (n=6) had a pre-operative mean IOP of 34.3 (10.9) mmHg on 3.8 (1.0) medications decreasing to 10.0 (0.82) mmHg on zero medications at 6 months. At post-operative week one, 4 (30.8%) of 13 eyes with prior glaucoma surgery had a transient layered hyphema (most common complication). No hyphemas were noted at post-operative week one in the juvenile group. There was no difference between pre- and post-operative visual acuity. The table summarizes proportions of qualified and complete success in each group.

Discussion: The GATT procedure is a novel, minimally invasive, conjunctival sparing surgical technique. In the juvenile group, the results are similar to ab externo trabeculotomy. In the refractory glaucoma surgery group, this technique provides an alternative to further complex glaucoma surgery. More follow up is required to determine the long-term safety and efficacy of this procedure.

Conclusions: The GATT procedure appears to be effective in reducing IOP in patients with previous failed glaucoma surgery and in eyes with juvenile glaucoma. Preliminary results appear promising in reducing IOP and medication use. The procedure had a good safety profile with few postoperative interventions.

Eyes with preoperative IOP ≥18mmHg, Qualified & Complete Success (IOP ≤21 & reduced by ≥20%)

	Month3	Month6	Month7-12
Juvenile	6 (100%)	4 (100%)	2 (100%)
Prior G Surg	10 (77%)	5 (100%)	2 (100%)
Total	16 (84%)	7 (100%)	4 (100%)

References

1. Girkin CA,Marchase N,Cogen MS. Circumferential trabeculotomy with an illuminated microcatheter in congenital glaucomas. J Glaucoma. 2012 Mar;21(3):160-3.
2. Chin S,Nitta T et al. Reduction of intraocular pressure using a modified 360-degree suture trabeculotomy technique in primary and secondary open-angle glaucoma: a pilot study. J Glaucoma. 2012 Aug; 21(6):401-7

13. Combined Trabectome and Cataract Extraction versus Combined Trabeculectomy and Cataract Extraction in Open Angle Glaucoma

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Purpose: To compare the surgical results of combined Trabectome and cataract extraction (CE) versus combined trabeculectomy (Trab) with mitomycin c (MMC) and CE in patients with open angle glaucoma (OAG).

Methods: This was a prospective and non-randomized study. 89 eyes in the Trabectome + CE group and 23 eyes in the Trabeculectomy MMC + CE were included in the study. The primary outcome evaluated was intraocular pressure (IOP) through one-year follow up. Success was defined as IOP < 21 mm Hg and reduced by 20% in the last two consecutive visits after surgery without the need for additional surgery. Complications, glaucoma medications, and the need for additional surgery were also evaluated.

Results: The mean pre-operative IOP in the Trabectome+CE was 22.1±5.5mmHg and reduced by 27% to 15.4±3.1mmHg ($p<0.01$) at one year. In the Trab MMC+CE group, pre-operative IOP was 23.0±10.7mmHg and reduced by 44% to 11.0±5.7mmHg ($p<0.01$) at one year. The success rate at one year in the Trabectome+CE group and Trab MMC+CE group was 95% and 87% ($p=0.2$) respectively. The mean glaucoma medication use preoperatively in the Trabectome+CE was 2.3 and reduced to 1.3 ($p<0.01$) at one-year follow up. In the Trab MMC+CE group it was 3.2 and reduced to 0.6 ($p<0.01$). 4 (4%) eyes in the Trabectome+CE group needed additional surgery within one-year compare to 3 (13%) eyes in the Trab MMC+CE group ($p=0.13$).

Discussion: The reduction of IOP was significantly lower at one year in both the Trabectome+CE and Trab MMC+CE groups. Also the success rate at one year was similar in both groups. The mean IOP at one year was lower in the Trab MMC+CE group compare to Trabectome+CE group. The Trab MMC+CE group had higher rate of additional surgery within one year than Trabectome+CE group but it did not reach statistical significance.

Conclusion: Both Trabectome and Trab MMC when combined with cataract extraction can significantly lower IOP in OAG patients and have similar success rate at one-year follow up.

14. Clinical Safety and Efficacy of 360-Degree Gonioscopy Assisted Transluminal Trabeculotomy (GATT) for the Treatment of Glaucoma: Interim Outcomes of Primary Glaucomas

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Purpose: To introduce a novel technique for 360-degree ab interno transluminal trabeculotomy. Additionally, to investigate the IOP lowering effect, risk profile, and postoperative complications of this technique.

Methods: This retrospective, IRB-approved chart review at Glaucoma Associates of Texas analyzed data of 79 eyes that underwent a GATT procedure for the treatment of primary glaucomas, including POAG (n=39), pseudoexfoliation (n=13), uveitic (n=8), pigmentary (n=5), and other open-angle glaucomas (n=14). Intraocular pressure (IOP), number of IOP lowering medications, visual acuity, complications, and secondary procedures were recorded at baseline, 1 day, 1 week, and then at 1, 3, and 6 months postoperatively.

Results: A 360-degree trabeculotomy was achieved in 65 (82.3%) of 79 eyes. 73 (92.4%) eyes had at least a 300-degree trabeculotomy . The pre-operative mean (SD) IOP was 26 (8.6) mmHg on 2.9 (1.2) medications, which decreased to 13.7 (6.3) mmHg on 0.7 (0.9) medications at 6 months. Mean follow-up time is 4.9 (range 3-8) months. At post-operative week one, 27 (35%) eyes had a transient layered hyphema (the most common complication). There was no difference between pre- and post-operative visual acuity. The table summarizes proportions of qualified and complete success.

Discussion: The GATT procedure is a novel, minimally invasive surgical technique. The preliminary results of this ab interno trabeculotomy are similar to the previously published results on ab externo approach in adults. The fact that the conjunctiva is spared makes this surgical procedure a very promising first line surgical glaucoma treatment. Longer follow up is required to determine the long-term safety and efficacy of this procedure.

Conclusions: The GATT procedure appears to be effective in reducing IOP in patients with primary glaucomas, with an excellent safety profile. Twelve month data will be reported in the future.

References

1. Chin S, Nitta T, Shinmei Y, et al. Reduction of intraocular pressure using a modified 360-degree suture trabeculotomy technique in primary and secondary open-angle glaucoma: a pilot study. J Glaucoma. 2012 Aug;21(6):401-7.
2. Godfrey DG, Fellman RL, Neelakantan A. Canal surgery in adult glaucomas. Curr Opin Ophthalmol. 2009 Mar;20(2):116-21.
3. Tanito M, Ohira A, Chihara E. Surgical outcome of combined trabeculotomy and cataract surgery. J Glaucoma. 2001 Aug;10(4):302-8.

Eyes with preoperative IOP ≥18mmHg, Qualified and Complete Success (IOP ≤21 AND reduced by ≥20%)

Pre Op IOP	Month3	Month6	Month7-10
>21	43 (86%)	11 (73%)	7 (100%)
18-21	12 (75%)	7 (88%)	2 (67%)
Total	55 (83%)	18 (78%)	9 (90%)

15. Combined Use of Two Trabecular Micro-Bypass Stents, One Suprachoroidal Stent and Travoprost in OAG Not Controlled by Trabeculectomy and Medication

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Introduction: An advantage of trabecular bypass therapy is restoration of natural physiologic outflow in OAG. Outcomes following multiple trabecular bypass stent implantation have demonstrated the value of this technology as titratable therapy to reduce IOP to ≤ 15 mmHg with sustained efficacy and safety. Further IOP reduction in refractory OAG may be achieved via combined use of either a topical glaucoma medication or a suprachoroidal stent. The purpose of this study was to assess intraocular pressure (IOP) lowering effects of two trabecular bypass stents, one suprachoroidal stent and postoperatively prescribed travoprost in refractory OAG previously not controlled following treatment with trabeculectomy and medications.

Methods: Prospective study by the Micro-Invasive Glaucoma Surgery (MIGS) Study Group. Phakic or pseudophakic subjects with OAG and IOP between 18 mmHg and 45 mmHg following trabeculectomy, use of 1 to 3 ocular hypotensive medications were enrolled. Subjects deemed by the investigator not eligible for medication washout (e.g., visual field status would be at risk by washout; IOP after washout expected to be > 45 mmHg) were excluded. After medication washout, 80 eligible subjects with unmedicated IOP ≥ 21 mmHg and ≤ 45 mmHg were implanted with two iStents and one iStent supra (Glaukos). One year efficacy endpoints were IOP reduction ≥ 20% and IOP ≤ 15 mmHg. Slit-lamp and optic nerve evaluation, BCVA and adverse events comprise the safety evaluation through five years.

Results: To date, 50 subjects have been enrolled and 30 subjects have presented at 6 months. Mean screening medicated IOP was 22.9 (SD 3.4; range 18-36) mmHg. Mean baseline IOP after medication washout was 26.5 (SD 2.6; range 22-35) mmHg. Month 6 IOP was 12.4 (SD 1.5) mmHg, representing a 52% IOP reduction. Medications were reduced from 1.3 (SD 0.5) preoperatively to one postoperatively. No intraoperative or postoperative ocular adverse events were reported to date.

Discussion: Data through six months show substantial IOP reduction, reduction in medications, and no adverse events.

Conclusions: Six month results in this study of two trabecular bypass stents, one suprachoroidal stent and one postoperative medication in refractory OAG subjects showed significant IOP reduction, reduction in drug burden, and overall favorable safety profile.

Reference

Belovay G, Naqi A, Chan B, Rateb M, MD, Ahmed I. Using multiple trabecular micro-bypass stents in cataract patients to treat open-angle glaucoma. J Cataract Refract Surg 2012; http://dx.doi.org/10.1016/j.jcrs.2012.07.017.

16. Incidence of Early Postoperative Bleb Leak, A Comparison of Closure Methods

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Purpose: To compare the modified-Wise (Condon closure) method of fornix-based conjunctival closure to wing type closures for trabeculectomy.

Methods: A retrospective chart review was conducted of primary fornix-based trabeculectomy with mitomycin-C, alone or combined with cataract surgery, performed by multiple surgeons at the New England Eye Center from January 2010 to February 2012. Cases of conjunctival closure with a modified-Wise closure were compared to cases with wing type closures. The primary outcome was presence or absence of a bleb leak within the first 30 days postoperatively, determined by examination with concentrated fluorescein at each postop visit. Secondary outcome measures were the percent of leaking blebs that required additional management for impending failure, leaks that required bleb re-suturing at the slit lamp, and overall failure rates at 6 months. Failure was defined as either re-operation for any reason, or resuming all preoperative glaucoma medications, or loss of vision > 4 lines.

Results: 151 of 177 reviewed surgeries met criteria. 82 had the modified-Wise conjunctival closure and 69 had a wing type closure. Early postoperative leak rates were 12.2% with the modified-Wise closure and 30.4% with the wing-type closure (p=0.0081). 20% of the leaking blebs in the modified-Wise group needed additional treatment for impending failure and none required suturing of the bleb leak. 38.1% of the leaking blebs with the wing-type closure required additional treatment for impending failure and 23.8% required bleb leak suturing. Overall failure rates at 6 months were 9.8% with the modified-Wise closure and 18.8% with the wing type closure, which did not reach statistical significance

Discussion: The modified-Wise closure method for fornix-based trabeculectomy with mitomycin-C reduces the incidence of early bleb leak and may improve outcomes and reduce the need for additional interventions.

Conclusion: Use of a simple and effective closure method that minimizes the risk of early bleb leak may decrease the need for additional intervention, decrease the time and cost of treatment, and potentially improve outcomes. The modified-Wise technique for closure of fornix-based trabeculectomies appears to achieve this goal of decreasing early postoperative bleb leaks in this early experience of multiple surgeons.

References

1. Wise, JB. Mitomycin-compatible suture technique for fornix-based conjunctival flaps in glaucoma filtration surgery. Arch Ophthalmol. 1993;111:992-7.
2. Condon, G. Closing the fornix based conjunctival flap. Eyetube; 2009. Available from: http://eyetube.net/video/closing-the-fornix-based-conjunctival-flap/
3. Henderson HWA, Ezra E, Murdoch IE. Early postoperative trabeculectomy leakage: incidence, time course, severity, and impact on surgical outcome. Br J Ophthalmol. 2004;88:626-29.

17. Correlation between AS-OCT Findings and IOP after Deep Sclerectomy (DS) Augmented with a Gold Micro-shunt (GMS) Implant in the Suprachoroidal Space

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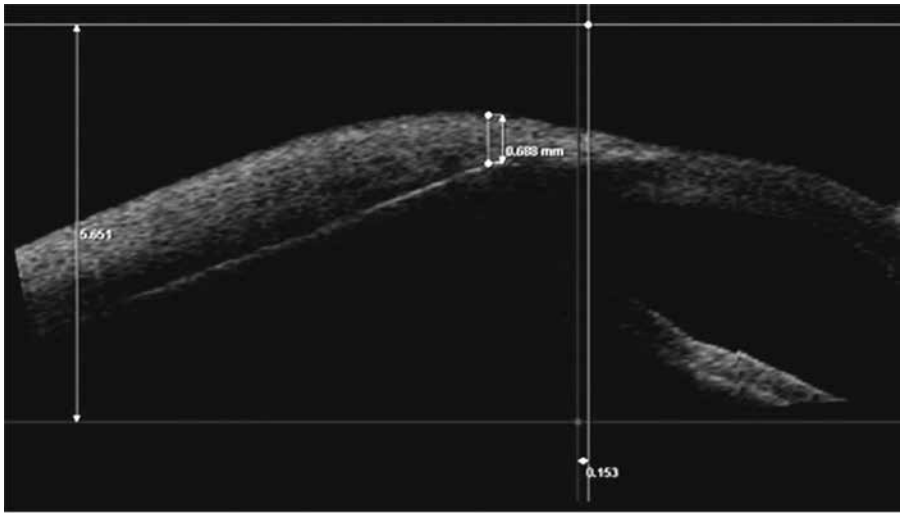
Purpose: To assess the correlation between AS-OCT findings and IOP lowering after deep sclerectomy with a Gold Micro-Shunt (GMS) implant in the suprachoroidal space (SCS).

Methods: Prospective case series of 23 eyes of 18 patients with open angle glaucoma who underwent deep sclerectomy with Mitomycin C (MMC), with a SCS implantation of GMS, with or without concomitant cataract surgery. All patients underwent AS-OCT in order to measure the area of subconjunctival filtering bleb, the area of suprachoroidal fluid, and scleral thickness. Outcome measures included correlation of the aforementioned OCT parameters and IOP at 6 months and 1 year after surgery.

Results: Eight females and 10 males, including 13 African-Canadians and 10 Caucasians underwent DS with GMS implantation. Mean age was 64 years. 11 eyes had combined cataract surgery, 8 eyes were phakic, and 4 eyes were pseudophakic. The average mean deviation (MD) was -18.1 dB ± 10.3. The pre-operative average IOP was 21.0 ± 7.8 mmHg with a mean number of 3.0 ± 1.6 medications. At 6 months, the average IOP was 14.3 ± 4.3 ($p = 0.0008$) on an average of 1.6 ± 1.9 medications ($p < 0.0001$). At 1 year, the average IOP was 15.6 ± 5.2 ($p = 0.0008$) on an average of 1.6 ± 2.1 medications ($p < 0.0001$). Nine eyes (39%) underwent goniopuncture. AS-OCT demonstrated no subconjunctival fluid. There was no significant correlation between the suprachoroidal fluid area and the change in IOP, however, scleral thickness ratio and change in IOP at six months and one year were significantly correlated.

Conclusions: Deep sclerectomy with MMC, augmented with a GMS in the suprachoroidal space lowers IOP and the glaucoma medication use in patients with open angle glaucoma. No subconjunctival fluid was noted on AS-OCT. There was a correlation between IOP lowering and an increase in the scleral thickness.



18. Outcomes of Pars Plana Glaucoma Drainage Implant in Boston Type 1 Keratoprosthesis Surgery

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Introduction: Glaucoma drainage implantation (GDI) in conjunction with Boston Type 1 Keratoprosthesis (KPro) placement is a surgical option in controlling postoperative glaucoma. However, GDI erosions have been reported with relative frequency. A posteriorly placed pars plana GDI with corneoscleral patch graft may allow for decreased risk of tube erosion. The purpose of this study is to report outcomes of combined pars plana vitrectomy and GDI in KPro patients.

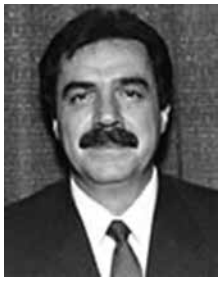
Methods: A retrospective review of patients who underwent pars plana GDI in combination with KPro was performed. Preoperative and postoperative parameters collected and analyzed included: visual acuity, intraocular pressure (IOP), number of glaucoma medications to achieve IOP control, bandage contact lens fit, and postoperative complications.

Results: Twenty eyes of 20 patients were identified; 95% had preoperative diagnosis of glaucoma, utilizing on average 2.5 medications with IOP of 19.8 mm Hg (±6.3, range 9-32.8 mm Hg) and visual acuity of logMAR 1.83 prior to surgery. After placement of the pars plana GDI, an average IOP of 17.3 mm Hg (±6.8, range 0-35 mm Hg) was managed with 1.9 medications and visual acuity was logMAR 0.98. Average follow-up was 22.5 months (±16.5, range, 2.5-60.5 months). Ninety percent had good contact lens fit. One eye experienced conjunctival erosion over an accessory Pars Plana Clip (New World Medical, Rancho Cucamonga, CA) requiring surgical revision. One eye experienced postoperative endophthalmitis and another eye experienced corneal melt; both eyes required GDI explantation.

Discussion: None of our patients experienced conjunctival erosion over a pars plana positioned GDI or tube. Our study differs from prior reports in the following technique: all of the GDIs were placed in the pars plana; accessory Hoffman Elbows (Abbott Medical Optics, Abbott Park, IL) were not utilized; and, corneal patch grafts were used for tube coverage.

Conclusions: For the long term management of glaucoma in KPro patients, a posteriorly placed pars plana GDI with corneal patch graft without the use of a Pars Plana Clip or Hoffman Elbow has a low risk of erosion and postoperative complications.

19. Long-term Results in 912 Ahmed Implants Placed without a Patch Graft in Mexico



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Purpose: We randomly selected and reviewed the records of 840 of the approx-imately 8700 patients operated with an Ahmed Glaucoma Implant between June 1993 and July 2009, in which a long-needle track was used instead of a patch graft.

Methods: A total of 912 Ahmed Glaucoma Implants without using a tube-covering patch and their 8152 visits were analyzed for IOP control, complications and rate of failure. Failure was defined as IOP over 21 mmHg (with or without massage and/or medications) or under 5 mmHg on 2 consecutive visits at least 1 month apart, loss of light perception, or need of additional surgery for IOP lowering. Kaplan-Meier survival analysis and generalized estimating equations were used for multivariate analysis of risk factors for failure, adjusting for dependencies when both eyes of the same patient had been operated, repeated measures and missing data.

Results: Mean age at first surgery was 56 (SD 19.6), mean preoperative IOP was 30.5 mmHg (SD 13.7), mean follow-up time was 29.3 months (range 1 day to 16 years). Success survival was 81.8% by 6 months, 76.4% at 1 year, 62.6% by 5 years, and 49% at 10 and 15 years. GEE analysis revealed coefficient B of failure is +0.73 for inferotemporal location (CI 0.5-1.4, p=0.036), +0.13 per 10 mmHg above 30 of preoperative IOP (CI 0.01-0.25, p=0.029) and -0.1 per decade over 56 years of age (CI 0.02-0.19, p=0.016). Mean last recorded IOP was 16.9 before massage and 15.1 mmHg after massage. Complications included glaucoma-related loss of light perception (NLP) in 35 eyes (3.8%), non-glaucoma related NLP in 20 eyes (2.2%), implant removal in 10 eyes (1.1%), tube retraction in 7 eyes (0.8%), tube exposure 4 eyes (0.4%), phthisis bulbi 3 eyes (0.3%), unresolved hypotony 2 eyes (0.2%), malignant glaucoma 2 eyes and plate exposure 2 eyes.

Conclusions: The long-term control of different glaucomas with Ahmed Glaucoma Implants placed without using patch grafts is good. Higher initial IOP, younger age and inferotemporal locations were risk factors for failure. Of particular note, the rate of tube exposures was very low using a long needle track technique.

20. Surgical Outcomes: Canaloplasty versus Trabeculectomy at 12 Months

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Purpose: To compare surgical outcomes of patients following canaloplasty and trabeculectomy through 12 months follow-up.

Design: Retrospective, non-randomized, comparative case series. Participants: Seventy-three eyes in 73 patients who underwent canaloplasty and 87 eyes in 87 patients who underwent trabeculectomy with 12 months postoperative follow-up were included.

Methods: Patients with open angle glaucoma who underwent either canaloplasty or trabeculectomy with mitomycin-C (MMC) to control the intraocular pressure (IOP) between January 2007 and December 2009 were included, All surgeries were performed by a single surgeon (RSA).

Main Outcome Measures: IOP, visual acuity, postoperative medications, surgical failure and complication rates.

Results: There were no differences in demographics, previous surgery, pre and post operation visual acuity between the groups. The mean percentage change in IOP from preoperative values to 12 months after the surgery was 27.7% ($\pm$ 22%) for canaloplasty group compared to 43% ($\pm$ 28%) for the trabaculectomy group (P = 0.01, Student t-test). Median reduction in the number of medications at 12 months follow-up was greater with trabeculectomy than canaloplasty (median reduction: 3 vs 2), though not statistically significant (P = 0.04). There was no difference in surgical failure rates between canaloplasty (n = 23, 32%) and trabeculectomy (n = 17, 20%) groups (P = 0.10).

Conclusions: Canaloplasty and trabeculectomy both achieved significant reduction in IOP at 12 months. The percentage reduction in the IOP at 12 month was higher following trabeculectomy with fewer patients requiring postoperative medications compared to canaloplasty.

Reference

Ayyala RS, Chaudhry AL, Okogbaa OB, Zurakowski D. Comparison of Surgical Outcomes Between Canaloplasty and Trabeculectomy at 12 Months' Follow-Up. Ophthalmology 2011;118(12):2427-33

21. Efficacy and Safety of Ab Interno Trabeculectomy with Trabectome in Juvenile Open Angle Glaucoma (JOAG)

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Purpose: To determine the efficacy and safety of Trabectome surgery on JOAG patients defined here as age of onset between 3 to 40 years old with open angles.

Methods: Prospective cohort study. Outcomes included IOP, glaucoma medications, and any secondary glaucoma surgeries. The success criterion for Kaplan-Meier survival analysis was: IOP $\leq$ 21 mmHg, IOP $\leq$ 20% from pre-operative IOP on the last 2 consecutive follow-up visits after 3 months, no secondary glaucoma surgery.

Results: No Prior Incisional Surgery: 51 eyes that had no prior incisional surgery underwent Trabectome and had a mean baseline IOP of 28.2 ± 8.7 mmHg with 3.1 ± 1.4 glaucoma medications. At 6 months postoperatively, IOP was 19.4 ± 6.5 mmHg ($p<0.01$) and medications 2.3 ± 1.3 ($p<0.01$). 80% of these eyes met the success criterion at 6 months. One patient had an IOP spike and two patients had hypotony on day 1. Six patients required subsequent glaucoma surgery.

With Prior Incisional Surgery: 26 eyes that had prior incisional surgery underwent Trabectome and had a mean baseline IOP of 27.5 ± 7.6 mmHg with 3.8 ± 1.2 glaucoma medications. At 6 months postoperatively, IOP was 19.2 ± 3.7 mmHg ($p<0.01$) and medications 3.2 ± 1.0 ($p=0.11$). 69% of these eyes met the success criterion at 6 months. Six patients had an IOP spike and two patients had hypotony on day 1. Eight patients required subsequent glaucoma surgery.

Trabectome + Cataract Surgery: 8 eyes underwent Trabectome combined with phacoemulsification and had a mean baseline IOP of 21.8 ± 3.3 mmHg with 2.4 ± 1.1 medications. At 6 months postoperatively, IOP was 14.8 ± 1.0 mmHg ($p=0.06$) with 2.3 ± 1.5 medications ($p=0.33$). 100% of these eyes met the success criterion at 6 months. No complications were reported and none of the patients required subsequent glaucoma surgery.

Discussion: The reduction of IOP was statistically significant in the Trabectome only with or without prior incisional surgery but not in the Trabectome with cataract surgery cases possibly due to small sample size. In addition, those that had no prior surgery showed a statistically significant difference in medication reduction.

Conclusion: Trabectome appears to be a safe and effective intervention for patients with JOAG.

Acknowledgement: We gratefully acknowledge trabectome surgeons who contributed cases through the Trabectome Users' Group.

22. Preliminary Results of the Trabeculectomy with Suprachoroidal Derivation

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Purpose: To evaluate the effectiveness of a novel glaucoma surgery in patients with secondary open angle glaucoma and refractory glaucoma. Methods:Prospective uncontrolled case series that included 8 eyes of 8 patients who underwent trabeculectomy with mitomicin C and suprachoroidal derivation with 2 autologous scleral flaps.Follow-up visits were on day 1, month 1, month 3 and month 6. Patients underwent slit-lamp examination, gonioscopy and ultrasound biomicroscopy of the anterior segment. Intraocular pressure, best corrected visual acuity and complications were registered.

Results: Before inclusion, the eyes averaged 3.0 ± 1.85 (range: 1 to 6) intraocular procedures. The mean pre-operative intraocular pressure was 23.63 ± 4.59 mmHg (range: 17 to 30 mmHg) and the mean number of pre-operative glaucoma medications was 2.75 ± 1.28 (range: 1 to 4). One day postoperatively intraocular pressure decreased a mean of 11.50 mmHg (p value= 0.0005), at 1 month 11.12 mmHg (p value=0.001), at 3 months 12.0 mmHg (p value=0.001) and after 6 months 11.75 mmHg (p value=0.0015). The mean number of post-operative glaucoma medications was 0.13 ± 0.35. Subconjunctival and suprachoroidal space were present when ultrasound biomicroscopy was performed. No severe complications were found.

Discussion: Unlike classic trabeculectomy, our surgical procedure has the advantage of using 2 different drainage pathways to lower the IOP, the anterior chamber to subconjunctival space fistula and the uveoescleral drainage through the suprachoroidal space.

If the filtration bleb becomes increasingly vascularized, and/or excessive capsular fibrosis appears, the uveoescleral pathway is still patent. In our patients, both subconjunctival and suprachoroidal fluid have been found. Ultrasound biomicroscopy may show an unusually evident suprachoroidal space.

Conclusions: This small prospective case series suggests that this novel procedure is an effective and secure surgical technique, achieving a statistically significant reduction of the intraocular pressure after 6 months of follow-up.

References

1. Jordan JF, Engels BF, Dinslage S.A novel approach to suprachoroidal drainage for the surgical treatment of intactable glaucoma. J Glaucoma. 2006 Jun;15(3):200-5.
2. Unal M, Kocak Altintas AG. Early results of suprachoroidal drainagetube implantation for the surgical treatment of glaucoma. J Glaucoma. 2011 Jun-Jul;20(5):307-14.3 Figus M, Lazzeri S, Fogagnolo P. Supraciliary shunt in refractory glaucoma. Br J Ophthalmol. 2011 Aug 26.

23. 8-year Review: Efficacy and Complications of Resident Performed Trabeculectomies at a County Hospital

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Purpose: To evaluate the long-term efficacy and complication profile of trabeculectomies performed by ophthalmology residents at Cook County Hospital.

Methods: A retrospective analysis of resident performed trabeculectomies at Cook County Hospital from 2003 to 2011. Data was collected on 293 eyes on 234 patients. Pre-operative and one-week, one-month, six-month, one-year and three-year post-operative data were collected. Primary measured outcomes were intra-ocular pressures (IOP) and number of medications. Secondary outcomes were type of complications.

Results: The average pre-operative IOP was 25.21 (SD +/- 9.28). At one week post-operation, the average IOP was 13.71 (SD +/- 9.34) ($P < 0.005$). At one month post-operation, the average IOP was 14.70 (SD +/- 8.47) ($P < 0.005$). At six months post-operation, the average IOP was 13.51 (SD +/- 5.23) ($P < 0.005$). At one year post-operation, the average IOP was 14.28 (SD +/- 5.26) ($P < 0.005$). 60 trabeculectomies who had complete three year data available. Their average pre-operative IOP was 26.31 (SD +/- 8.44) and the average of the three-year post-operative IOP was 13.95 (SD +/- 7.22) ($P < 0.005$). The average number of pre-operative topical medications was 3.56 (SD +/- 1.15). At six months post-operation, the average number of medications was 1.45 (SD +/- 1.43) ($P < 0.05$). At one year, the average number of medications was 1.45 (SD +/- 1.33) ($P < 0.05$). For eyes with three-year data, the average pre-operative number of medications was 3.58 (SD +/- 1.12) and the average number of post-operative medications was 2.15 (SD +/- 1.49) ($P = 0.10$). Complications were as follows: bleb failure (n = 42), chronic/late bleb leakage (n = 15), cataract (n = 30), persistent hypotony (n = 3), endophthalmitis (n = 2), hyphema (n = 1), retinal detachment (n = 1), IK touch (n = 1), ptosis (n = 1).

Discussion: The outcomes of trabeculectomies performed by residents at Cook County Hospital have a good success rate, comparable to previously published data. IOP lowering is statistically significant throughout the follow up period. Number of medications also decreased post-operatively, which remained statistically significant, except at the third year. Rates of complications were also similar to that found in previous literature.

Conclusion: At our institution, resident performed trabeculectomies under the supervision of attending surgeons are efficacious and safe. Future study should examine the high level of non-compliance with follow up in this population.

24. Two Year Results for 180° Trabectome Ablation

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Purpose: To assess extensive, 180° trabectome ablation and post-ablation viscoelastic tamponade instead of standard 2 clock hours in trabectome-eligible eyes using very broad inclusion criteria.

Methods: We analyzed prospective, non-randomized, single surgeon results of 198 subsequent patients who underwent a modified trabectome surgery. The only exclusion criteria were active neovascularization, increased episcleral venous pressure, more than mild, active uveitis and angle dysgenesis. Outcome measures were IOP and glaucoma medications.

Results: 192 trabectome patients qualified for this analysis with a collective preoperative IOP of 20.1±8.2 mm Hg and 1.8 glaucoma medications. At 12 months, IOP reduced by 28% to 14.5±4.5 mm Hg (n = 85, $p<0.05$) and drop usage nearly halved (0.8). The IOP pattern in mm Hg was 16.9±7.4 on postoperative day 1 (POD1), 15.0±4.7 (POD30), 14.9±5.3 (POD90), 14.2 ±4.1 (POD180), 16.6 ±5.2 (POD540, n=22), 15.5 ±3.1 (POD720, n=4). This translated to a reduction by 17%, 26%, 26%, 29% and 28% during year 1. Only 3 large hyphemas occurred with visual acuity less then 20/200 and these resolved within the second week. No other complications were observed.

Conclusions: Despite a low preoperative mean IOP of only 20 mm Hg that had been hypothesized to be associated with a decreased surgical success rate in the past, this non-selectively reported data indicates that reasonable pressure drops can be achieved in most hypertensive eyes without serious complications using an extensive ablation and viscoelastic tamponade.

25. Second Ahmed Valve Implant in Mexican Patients with Refractory Glaucoma: Long-term Results

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Purpose: To determine the safety and effectiveness of a second Ahmed valve implant in eyes with refractory glaucoma and indications associated with the need to place a second Ahmed valve. Intraocular pressure (IOP) control, the need for additional medical or surgical treatment, complications and changes in vision were studied.

Methods: We carried out a retrospective, case series analysis of all patients who received two Ahmed valves in one eye.

Results: 48 eyes of 45 patients (26 females, 57.8%), with a median age being 34.2 years (range 3 to 78 years) and median follow-up of 26.2 months (range 0.5 to 144) were included in the analyses. The most frequent primary diagnoses associated with the need to place a second Ahmed valve were congenital glaucoma (n=11, 22.9%), followed by primary open-angle glaucoma (n=8, 16.7%) and neovascular glaucoma (n=6, 12.5%). Secondary glaucomas comprised 43.8% of cases (n=21). The time elapsed between the implant of the first and second valve averaged 40.6 months. Initial mean IOP was 24 mmHg, and mean IOP at last visit was 14mmHg. The 7-year Kaplan-Meier survival rate to maintain IOP under 18 was 66.!% and below 15 mmHg was 48.6%. The average number of surgical procedures for glaucoma control performed before placement of the second Ahmed valve was 2.6 per eye, the most frequent being perivalvular fibrosis removal. The average number of surgeries performed after placement of the second Ahmed valve was 0.5 (std. dev. 0.71, range 0 to 3), the most frequent being repositioning of the tube in 13 eyes (27.1%), followed by fibrosis removal in 12 (25%), and subconjunctival bevacizumab in 8 (16.7%). The number of additional drugs required to control IOP was 4 drugs in 27% of eyes, 3 drugs in 21%, 2 drugs in 25%, 1 drug in 15% and 22% required no medications. The most common complications were corneal decompensation due to tube-endothelial touch (n=8, 16.7%), transient flat anterior chamber (n=6, 12.5%), and transient choroidal detachment in (n=4, 8%). Visual acuity worsened in 33.3% of cases, improved in 20.8%, remained unchanged in 16.7%, not recorded in 29.2% and No Light Perception in 4.2%.

Conclusions: Implanting a second Ahmed valve is a viable alternative for long-term management of glaucoma previously treated with an initial Ahmed valve and is associated with an acceptable safety profile.

26. Comparison of Surgical Outcomes of the Ex-PRESS Glaucoma Filtration Device with Mitomycin C in Phakic and Pseudophakic Eyes

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Purpose: To compare the surgical outcomes of the Ex-PRESS glaucoma filtration device with mitomycin C in phakic and pseudophakic eyes.

Methods: Retrospective comparative case series of 76 eyes (40 phakic eyes and 36 pseudophakic eyes) that underwent placement of Ex-PRESS glaucoma filtration device for uncontrolled glaucoma. All pseudophakic eyes had prior clear-corneal phacoemulsification. The primary outcome measures were intraocular pressure, number of postoperative glaucoma medications, and surgical success. Surgical success was defined as intraocular pressure between 5 and 18 mmHg, with or without glaucoma medications, and without further glaucoma surgery or loss of light perception vision

Results: Average follow-up was 32.3 ± 7.9 (range, 15-47) months for phakic eyes and 29.0 ± 8.8 (range, 14.3-47) months for pseudophakic eyes. No significant difference was observed between phakic and pseudophakic eyes in mean intraocular pressure, change from baseline intraocular pressure,or adjunctive use of glaucoma medications at 33 months follow-up. Surgical success by Kaplan-Meier survival analysis at 33 months was 80.00% for phakic eyes and 80.65% for pseudophakic eyes (P = 0.94).

Discussion/Conclusion: Surgical outcomes after insertion of the Ex-PRESS glaucoma filtration device were similar in phakic and pseudophakic eyes after prior clear-cornealphacoemulsification.

References

1. Gross RL, Feldman RM, Spaeth GL, et al. Surgical therapy of chronic glaucoma in aphakia and pseudophakia. Ophthlamology1988;95:1195-1201.
2. Shingleton BJ, Alfano C, O'Donoghue MW, et al. Efficacy of glaucoma filtration surgery in pseudophakic patientswith or without conjunctival scarring. J Cataract Refract Surg 2004;30:2504-2509
3. Takihara Y, Inatani M, Seto T, et al.Trabeculectomy with mitomycin c for open-angle glaucoma in phakic vs pseudophakic eyes after phacoemulsificationn. Arch Ophthalmol 2011; 129 (2):152-157.
4. Supawavej C, Nouri-Mahdavi K, Law SK, et al. Comparison of results of initial trabeculectomy with mitomycin c after prior clear-cornealphacoemulsification to outcomes in phakic eyes. J Glaucoma 2011 May 26. [Epub ahead of print]

27. Outcomes of Glaucoma Drainage Implants With and Without Mitomycin C in Aniridic Glaucoma

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Purpose: To determine outcomes of tube shunt placement in aniridic glaucoma patients with and without the use of mitomycin-C (MMC).

Methods: Retrospective case review of aniridic glaucoma patients undergoing Baerveldt tube shunt placement at a single institution between 2003-2011 with >1 year of follow-up. Vision, intraocular pressure (IOP), number of medications (NOM), patch graft type and complications were reviewed. Patients with previous tube shunt, previous cyclophotocoagulation, or that had a prosthetic cornea at time of surgery were excluded. Absolute success (AS) was defined as both IOP<21mmHg and >30% reduction from preoperative IOP at 1 year without further surgical intervention. Qualified success (QS) cases met criteria for AS but required tube repositioning.

Results: Of the 62 eyes reviewed, 34 eyes of 24 patients met inclusion criteria. There were 22 eyes (63%) in the MMC (A) group and 14 (37%) in the non-MMC (NA) group. Mean follow up data was available for 58 months and 33 months in the A and NA groups respectively. Mean preoperative IOP and NOM were 29 and 2.9, respectively, in the A group and 25 and 3.6 in the NA group (p=0.16 and p=0.04 for preop IOP and NOM, respectively). At one year post-op, mean IOP and NOM were 14 and 0.48 in the A group and 12 and 1.5 in the NA group. The criteria for AS was met in 12 (57%) in the A group and 9 (75%) of the NA group (p=0.32). 9 (75%) of the A group that met AS did so without the use of any IOP drops compared to 2 (22%) of the NA group (p=0.01). QS was met in 15 (71%) in the A group and 10 (83%) in the NA group (p=0.46). Further surgical management was required in 3 eyes in the A group (14%) compared to 1 (8.3%) in the NA group (p=0.62).

Discussion: The use of MMC in aniridic glaucoma patients undergoing tube shunt surgery is statistically comparable to surgery without MMC in both absolute and qualified success. The A group had a statistically significant lower NOM at 1 year (p=0.01) compared to the NA group without a statistically significant difference in IOP (p=0.28). The complication rates were not statistically significant (p=0.63).

Conclusions: Aniridic glaucoma represents a challenge to glaucoma surgeons, including ocular surface disease that limits the ability to use topical medications. The use of MMC may help decrease the number of medications required after tube shunt surgery in aniridic glaucoma eyes.

28. Two-Year Outcome of Trabeculotomy and Goniotomy in Primary Congenital Glaucoma

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Purpose: Trabeculotomy (TR) or goniotomy (GO) are treatments for Primary Congenital Glaucoma (PCG). The aim was to study the efficacy of surgery and compare intraocular pressure (IOP) control at 1 & 2 years after either procedure.

Methods: A retrospective chart review of children with PCG who received TR or GO was conducted. Exclusion: Children with other forms of childhood glaucoma (secondary), or history of other previous surgery (incisional or cilioablation). Demographics, type of surgery, IOP and number of glaucoma medications before and 1 & 2 years after surgery were recorded. The number of eyes achieving different levels of IOP control was calculated. Means, standard deviations (SD), T tests and Chi-square analyses were performed.

Results: A total of 15 eligible patients received 27 TR or GO. Eleven eyes underwent 14 TR and 10 eyes had 13 GO. Mean IOP at baseline, 1 & 2 years was 30.7, 18.6 & 21.1 mmHg, respectively. IOP reductions from baseline at 1 & 2 years were 39% & 31%, respectively ($p \leq 0.001$). The number of medications at baseline, 1 & 2 years was 0.4, 0.9 & 1.3 ($p > 0.05$). Comparison of number of eyes that achieved different levels of IOP control (IOP>5 and <18, <21, or <24mmHg) showed no difference between TR & GO ($p > 0.05$) (Table 1).

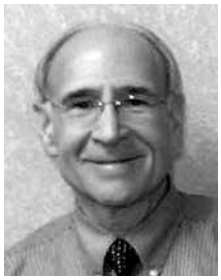
Discussion: TR and GO are effective treatments for PCG, yielding significant reduction in IOP for up to 2 years, with no significant difference between treatments in this cohort. A trend of increasing number of medications from baseline was not statistically significant at 1 or 2 years after surgery.

Conclusion: Both TR and GO were effective treatments for PCG. A larger prospective trial can assess long term success.

Table 1. IOP (mmHg) outcomes 1 and 2 years after TR vs GO.

	1 Year			2 Year		
	TR (n=13)	GO (n=9)	p	TR (n=7)	GO (n=8)	p
5<IOP<18	4	3	0.90	1	1	0.92
5<IOP<21	8	7	0.42	4	5	0.83
5<IOP<24	13	7	0.07	5	5	0.71

29. The IOP Lowering Efficacy of Combined Excimer-Laser-Trabeculostomy and Phacoemulsification in Glaucoma Patients Remains Consistent Over 5 Years



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Purpose: Excimer Laser Trabeculostomy (ELT) is a novel surgical treatment for open angle glaucoma in which channels are created ab interno through the trabecular meshwork into Schlemm's canal. This study reports the long term (5-year) intraocular pressure (IOP) lowering efficacy of ab interno Excimer Laser Trabeculostomy (ELT) in patients with open angle glaucoma.

Methods: 46 eyes of 46 patients aged 64±18 years with a diagnosis of open angle glaucoma (primary open angle glaucoma: 35, ocular hypertension: 7, secondary glaucoma: 2, pseudoexfoliation glaucoma: 2) were included in a prospective study (F/M: 37/9) in which 5 to 10 channels (200 µm diameter) were created by non-thermal UV photoablation with an excimer laser (AIDA, TUILAS, Nuremberg, Germany; wavelength 308nm) in the trabecular meshwork and inner wall of Schlemm's canal in the lower nasal quadrant by a single surgeon (U.G.) The intraocular pressure (IOP) was measured 1 month post intervention and compared to that of all later follow-up visits: 3, 6, 12, 24, 36, 48, 60 months (M) post ELT to determine whether IOP lowering efficacy remained stable over time. The number of pressure lowering medications was concurrently monitored.

Results: Pre-op IOP on max meds was: 25.5 ± 6.3; Post-op 1 day: 13.3 ± 4.5; 1 M: 16.3 ± 4.3; 3 M: 16.0 ± 2.8; 6 M: 16.2 ± 5.5; 12 M: 16.0 ± 3.8; 24 M: 15.6 ± 6.0; 36 M: 15.2 ± 3.7; 48 M: 15.2 ± 3.4; 60 M: 15.9 ± 3.0. At each measurement, the IOP readings were significantly lower than pre-op ($P<0.001$). The changes in IOP (mmHg) from baseline (1-month post-op) were 3 M: 0.3; 6 M: 0.1; 12 M: 0.3; 24 M: 0.7; 36 M: 1.1; 48 M: 1.1; 60 M: -0.4. Statistics: ANOVA, repeated measurements, pairwise t-test, SPSS 17.0 (Bonferroni correction). The number of pressure lowering medications was reduced from pre-op 1.93±0.87 to 0.53±0.66 at 12 M and to 0.93±1.12 at 60 M.

Conclusion: Excimer Laser Trabeculostomy appears to be safe and effective in lowering IOP for at least five years in primary open-angle and secondary glaucoma. The long-term lowering of IOP after ELT was comparable to that of previous studies of much shorter duration. Within a range of 0.1 to 1.1 mmHg, the IOP post ELT remained stable and consistently at least 35% lower than pre-op IOP measurements over a 5-year post-op period. No additional procedures were needed in any patients in this cohort.

30. The Efficacy of Transscleral Diode Laser Cyclophotocoagulation on Lens Status

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Purpose: Transscleral cyclophotocoagulation (TSCPC) has been used to treat refractory glaucoma since the 1930s. Prior studies have shown that age, gender, and type of glaucoma appear to be associated with the effect of TSCPC on intraocular pressure control. The purpose of this study is to evaluate intraocular pressure in patients having undergone transscleral cyclophotocoagulation in relation to their lens status to determine whether phakics, pseudophakes, or aphakes show a heightened response to TSCPC.

Methods: 102 eyes of 102 patients from 2008 to 2011 at two academic centers were retrospectively studied. 65 were phakic, 27 pseudophakic, and 10 aphakic or with anterior chamber intraocular lenses. Main outcome measure included intraocular pressure at 6 months postoperatively. Patients included those with neovascular glaucoma, traumatic glaucoma, inflammatory glaucoma, open angle glaucoma, congenital glaucoma, angle closure glaucoma, and secondary glaucoma developing after penetrating keratoplasties. Success was defined as an intraocular pressure between 4 mmHg and 21 mmHg. Each patient underwent transscleral cyclophotocoagulation with the semiconductor diode laser using the "G-probe" hand piece.

Results: Average fluence for each group was 78.1 in the phakic group, 74.2 in the pseudophakic group, and 86.2 in the aphakic group. 53.8% (35/65) phakic patients achieved the target intraocular pressure with mean preoperative IOP of 40.5 +/- 13.7 mmHg and a mean postoperative IOP at 6 months of 23.4 +/- 17.5 mmHg. 51.8% (14/27) pseudophakic patients achieved the target IOP with a mean preoperative IOP of 36.9 +/- 12.0 mmHg and mean postoperative IOP at 6 months of 17.8 +/- 11.2 mmHg. 60% (6/10) aphakic patients achieved the target IOP with a mean preoperative IOP of 40.9 +/- 11.1 mmHg and mean postoperative IOP at 6 months of 17.4 +/- 13.2 mmHg. Eighteen patients required repeat transcleral diode cyclophotocoagulation within the 6 month period, 11 in the phakic group, 4 in pseudophakic group, and 3 in the aphakic group.

Discussion: While in this study 53.9 % of all patients achieved the target intraocular pressure, there was no statistically significant difference ($P = 0.907$, Chi-square test) amongst the different lens status on efficacy of intraocular pressure lowering. TSCPC settings were similar for all three groups.

Conclusions: TSCPC is an effective way to lower intraocular pressure in patients with refractory glaucomas. Success rates amongst the three groups, phakics, pseudophakics, and aphakics were similar (53.8%, 51.8%, 60% respectively).

31. Trabectome Outcome of Glaucoma Patients with Steroid Induced Glaucoma

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Introduction: Trabectome outcome of glaucoma patients with steroid induced glaucoma

Methods: This is a prospective, controlled, non-randomized study on 15 patients that have been diagnosed with steroid induced glaucoma. Outcome measurements recorded include IOP and glaucoma medications before and after the surgery.

Results: The average pre-operative IOP was 30.7 ± 8.0 mmHg and average pre-operative glaucoma medication usage is 3.5 ± 1.2. At 12 months, the IOP reduced to 16.3 ± 3.8 mmHg ($p=0.03$) and glaucoma medication reduced to 2.0 ± 1.4 ($p=0.62$). Hyphema was reported on 1 patient that was subsequently cleared without further intervention, and no other complications were noted on any patient. No patient was required to undergo subsequent glaucoma surgery. The survival rate was 100% where success was defined as IOP reduced by 20%, IOP < 21 mmHg, and no secondary surgery.

Discussion: At 12 months, IOP was reduced statistically significantly.

Conclusions: Trabectome is a safe micro-incisional glaucoma surgery for steroid induced glaucoma patients.

32. Combined Vitrectomy with Gas Tamponade and Posterior Glaucoma Tube Placement in the Management of Complicated Uveitic Glaucoma

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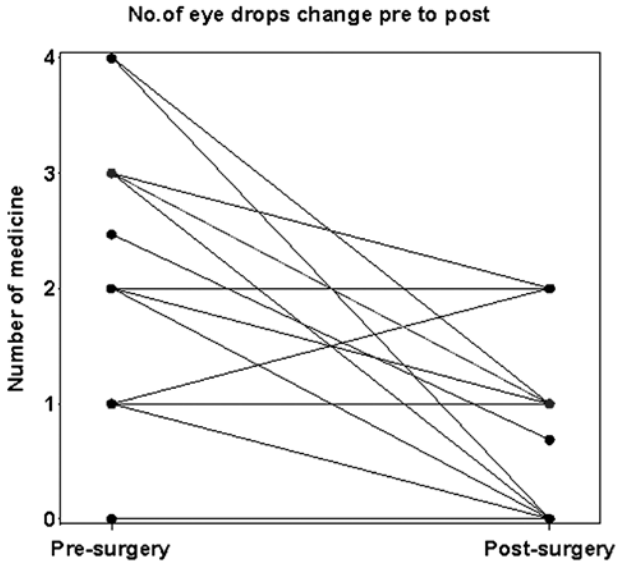
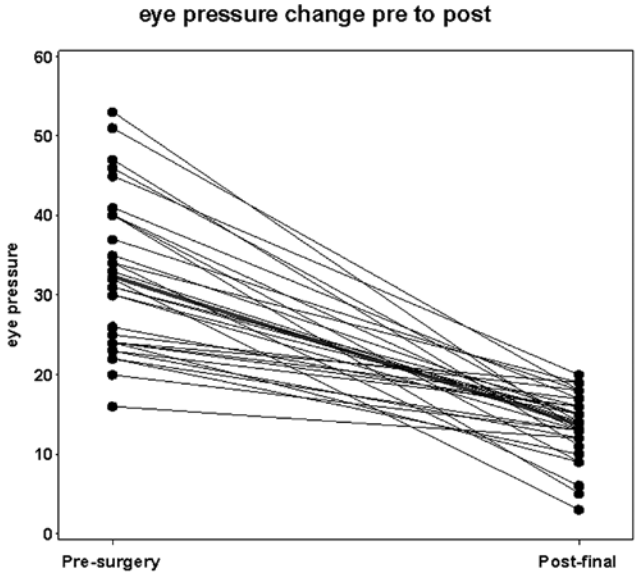
Purpose: To analyze the efficacy of vitrectomy with gas tamponade and pars plana insertion of a glaucoma tube shunt in the management of complicated uveitic glaucoma.

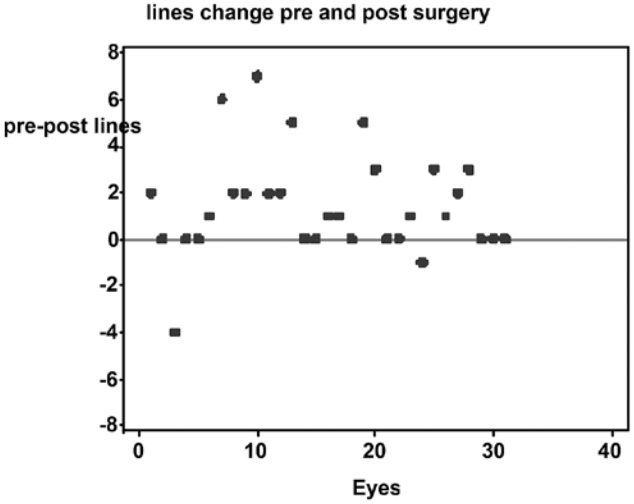
Methods: This is a non-randomized, un-masked, retrospective chart review of patients with uncontrolled glaucoma due to uveitis. Patients on maximum medical treatment with persistent elevated intraocular pressure (IOP) and glaucomatous visual field loss underwent combined vitrectomy, gas fluid exchange and pars plana insertion of either a Baerveldt® Glaucoma Implant 250mm or 350mm (Abbott Medical Optics, Inc) or Molteno3® 175mm (IOP Ophthalmics). Pre and post operative IOP, number of glaucoma medications, visual acuity and uveitic recurrences were compared.

Results: Included in the analysis were 31 eyes of 25 patients with uveitis and secondary glaucoma. Baerveldt® 250mm implants were placed in 19 patients, Baerveldt® 350mm implants were place in 10 patients, and Molteno3® 175mm implants were placed in 2 patients. The mean pre-operative IOP was 32.35 mmHg and the mean post operative IOP was 13.68 mmHg. There was a significant decrease of 18.7 ±1.9 mmHg between pre and post operative IOPs (p value <.0001). The mean number of glaucoma medications used was 2.48 pre and 0.71 post-operatively. There is a significant decrease of 1.77 ± 0.27 medications required following surgical procedure (p value <.0001). The visual acuities were either unchanged or improved in 29/31 eyes (93.54%). Sixty-five percent (20/31) of eyes had no recurrence of ocular inflammation post-operatively. Only 6% (2/31) postoperative hypotony was seen without any associated complications, including vision loss.

Conclusion: Combined vitrectomy, gas tamponade and pars plana placement of a glaucoma tube is a safe and effective method of lowering elevated IOP due to uveitic glaucoma. The majority of eyes required fewer glaucoma medications, had preserved or improved visual acuity and had fewer recurrences of uveitis







33. Modified Baerveldt Implantation, a New Surgical Approach for the Treatment of Uncontrolled Eye Pressure in Eyes with no Previous Glaucoma Surgery

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Introduction: The purpose of this study is to describe a new surgical technique for eye pressure control and give short term post-operative pressure and safety data.

Methods: Trabeculectomy has been the preferred surgical procedure for uncontrolled eye pressure in eyes at low risk for failure. Even in these eyes, failures are not uncommon. Failure occurs when filtration across the scleral flap ceases from scleral or conjunctival scarring. A new technique has been developed that utilizes the body of the Baerveldt implant to create a large superior bleb and prevent failure by maintaining the bleb space. This is accomplished by placing the body of the implant superiorly at the 12:00 position, sutured to the sclera only 5mm posterior to the limbus. The implant is placed over the superior rectus muscle and modified with a trapezoidal section of the implant cut out to avoid the implant affecting the movement of the superior rectus. The tube is ligated with vicryl and fenestrated for short-term pressure control. Outcome measures include pre-operative intraocular pressure, post-operative intraocular pressure at 5 weeks and 2 months, number of glaucoma medications, best corrected visual acuity, and complications.

Results: 22 patients underwent implantation of a Baerveldt implant with the modified technique. Follow-up data was available for an average of 15.2 weeks. The pre-operative IOP averaged 24.3 mmHg with patients taking an average of 3.2 medications. Post-operatively pressures improved significantly to an average of 14.5 mmHg with only 0.8 medications. One patient required viscoelastic reformation of a shallow anterior chamber.

Discussion: Early experience with superior implantation of a modified Baerveldt implant suggests it may be a safe and effective alternative to trabeculectomy. The operative course is similar to that seen with a standard Baerveldt implant technique, but the anterior placement at the 12:00 position creates a large bleb similar to a successful trabeculectomy. Several patients have untreated pressures in the single digits and low teens. The safety profile seems to be similar to other glaucoma implant procedures.

Conclusions: It appears that a Baerveldt glaucoma implant can be used to create a superior bleb, similar to that seen with a successful trabeculectomy. The surgical technique may give more consistent outcomes than standard trabeculectomy.

34. Comparison of the Outcomes of Trabectome with Trabeculotomy with Deep Sclerectomy – Ab Interno versus Ab Externo Approach

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Introduction: We compare the outcomes of Trabectome® and trabeculotomy with deep sclerectomy (TDS) in Japanese patients.

Methods: This matched-pair study compares 20 eyes undergone TDS to 20 eyes from Trabectome® from the same surgeon. The matching criteria included age, combined phacoemulsification and type of glaucoma. The outcome measures recorded are intraocular pressure (IOP), glaucoma medications before and after surgery and the occurrence of post-operative secondary surgeries.

Results: Trabectome® cases (n=20) had a mean pre-operative IOP of 27.5 ± 10.6 mmHg and 2.8 ± 1.0 glaucoma medications. At 12 months, the mean IOP was reduced from baseline to 15.7 ± 2.8 mmHg ($p<0.01$) and the mean number of glaucoma medication reduced to 1.3 ± 1.3 ($p<0.01$). TDS cases (n=20) had a mean pre-operative IOP of 26.4 ± 7.9 mmHg and 3.1 ± 1.2 glaucoma medications. At 12 months, the mean IOP was reduced from baseline to 13.5 ± 3.7 mmHg ($p<0.01$) and glaucoma medications reduced to 2.1 ± 1.0 ($p<0.01$). The survival rate at one year was 100% in Trabectome® group and 94% in TDS group where the success is post-operative IOP < 21 mmHg, IOP reduced by 20% from baseline and no secondary surgery.

Discussion: There was no statistical significant difference between Trabectome® and TDS in IOP ($p=0.06$) and medications ($p=1.0$) at 12 months. The log rank test did not show a statistical significant difference in survival between Trabectome® and TDS ($p=0.3$).

Conclusions: Both Trabectome® and TDS successfully lower IOP and the need for glaucoma medications. Trabectome® is a viable alternative to TDS in Japanese patients.

References

1. Tanihara H, Negi A, Akimoto M, et al. Surgical effects of combined trabeculotomy and sinusotomy compared to trabeculotomy alone. Acta Ophthalmol Scand 2000; 78:191-95.
2. Francis BA, See RF, Rao NA, et al. Ab interno trabeculectomy: development of a novel device (Trabectome) and surgery for open-angle glaucoma. J Glaucoma 2006;15:68-73.
3. Minckler DS, Baerveldt G, Alfaro MR, Francis BA. Clinical results with the Trabectome for treatment of open angle glaucoma. Ophthalmology 2005;112:962-67.

35. Baerveldt-250-mm^2 Glaucoma Drainage Devices in Eyes with Preexisting Scleral Buckles

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Purpose: To evaluate Baerveldt-250-mm^2 glaucoma drainage device (GDD) outcomes in patients with preexisting scleral buckles.

Methods: Retrospective chart review of 17 eyes of 16 glaucoma patients with preexisting scleral buckles for retinal detachments that underwent placement of a Baerveldt-250-mm^2 GDD at Kellogg Eye Center, Ann Arbor, MI from January 1, 2005-June 30, 2010. Baseline characteristics; pre- and postoperative visual acuity (VA), intraocular pressure (IOP), and number of glaucoma medications; and intra- and postoperative complications were recorded and analyzed.

Results: Mean age was 64.8 years (SD 18.3 years). Mean follow up was 23.9 months (range 3.6-52.8 months). Mean number of prior intraocular surgeries was 2.8 (SD 1.4). Preoperative mean logMAR VA was 1.1 [Snellen equivalent 20/200] (SD 0.9), mean IOP was 25.5mmHg (SD 9.7mmHg), and mean number of glaucoma medications was 3.5 (SD 1.3). At last follow up, mean postoperative logMAR VA was 1.1 [Snellen equivalent 20/200] (SD 0.9) ($p=0.45$), mean IOP was 9.8mmHg (SD 4.2) ($p<0.001$), and mean number of glaucoma medications was 1.2 (SD 1.4) ($p<0.001$). Four eyes (24%) had IOP between 6-21mmHg without glaucoma medications or additional pressure IOP-lowering procedures. Nine eyes (53%) had IOP between 6-21mmHg with glaucoma medications or additional pressure IOP-lowering procedures. Two eyes (11%) required additional glaucoma procedures for continued elevated IOP. Intraoperative trimming of the Baerveldt plate or removing a segment of the scleral buckle did not significantly affect postoperative mean visual acuityVA, IOP, or number of glaucoma medications. The most common postoperative complications were hypotony (3 eyes [18%]), conjunctival dehiscence (2 eyes [12%]), and concurrent conjunctival dehiscence causing hypotony (2 eyes [12%]); six of these 7 complications occurred within the first 3 postoperative months. Two Baerveldt plates (12%) required removal for recurrent conjunctival dehiscence; two eyes (12%) became phthisical due to hypotony-related complications.

Discussion: The surgical treatment of glaucoma in eyes with preexisting scleral buckles is challenging due to conjunctival scarring and space restrictions, making the low profile, smaller surface area Baerveldt-250-mm^2 glaucoma implant a reasonable option. Hypotony and conjunctival dehiscence were common complications. Nonetheless, we found that the Baerveldt-250-mm^2 GDD effectively lowers IOP and reduces the number of glaucoma medications needed.

Conclusions: In eyes with preexisting scleral buckles, the Baerveldt-250-mm^2 GDD successfully lowers IOP.

36. S3 (Pediatric) Ahmed Valves for the Surgical Management of Glaucoma in Advanced Age

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Purpose: To report the safety and efficacy of S3 (Pediatric) Ahmed Glaucoma Valves in patients over the age of 85.

Methods: A retrospective chart review of patients under the care of Dr. Andrew Crichton in Calgary, Alberta. Pre-, intra- and post-operative visits were recorded. Outcome measures include intraocular pressure, number of glaucoma medications, visual acuity and complications related to surgery.

Results: 10 patients have reached a minimum of 3 months of follow-up. 9 females and 1 male were included with a mean age of 88.2 years. At baseline mean Goldmann IOP was 22.3mmHg on an average of 2.9 glaucoma medications. In patients with a minimum of 3 months follow-up (n=10) mean IOP was 17.9mmHg on 1.3 glaucoma drops, a decrease of 4.4mmHg and 1.6 glaucoma drops. Visual acuity had decreased 0.9 lines on average in the operated eye and 0.25 in the non-operated eyes. At 6-months (n=6) mean IOP was 17.3 on 1.4 glaucoma drops, a decrease of 5.0 mmHg and 1.5 glaucoma drops. Visual acuity was 1.8 lines decreased on average from baseline. In non-operated eyes, no change was noted in vision from baseline on average. No major adverse events were noted.

Discussion: In most parts of the world people are living longer and healthier lives than ever before.[1] Balancing risks and benefits of surgery with life expectancy is prudent. Although evidence in the glaucoma literature is limited, advanced age has been described as an independent risk factor for complications in cataract and retina literature.[2]
The S3 Ahmed Glaucoma Valve designed for small globes or pediatrics differs from the S2 valve with regards to the size and surface area of the plate (96mm^2 vs 184mm^2) but is otherwise similar in design and function. The smaller footplate may result in less diplopia, a debilitating complication for elderly patients, and possibly less tissue trauma. Some major studies such as the Tube Versus Trabeculectomy study excluded patients above the age of 85.[3] In this advanced age group, there is a paucity of data related to surgical options and outcomes.

Conclusions: The S3 Ahmed Glaucoma Valve appears to be a viable modality for patients requiring glaucoma surgery at an advanced age.

References

1. Fries, J.F., B. Bruce, and E. Chakravarty, *Compression of morbidity 1980-2011: a focused review of paradigms and progress.* J Aging Res, 2011. 2011: p. 261702.
2. Desai, P., D.C. Minassian, and A. Reidy, *National cataract surgery survey 1997-8: a report of the results of the clinical outcomes.* Br J Ophthalmol, 1999. 83(12): p. 1336-40.
3. Gedde, S.J., et al., *The tube versus trabeculectomy study: design and baseline characteristics of study patients.* Am J Ophthalmol, 2005. 140(2): p. 275-87.

37. Prospective, Randomized, Controlled Trial of Second Generation Trabecular Bypass Stents for Mild-moderate OAG

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Purpose: A prospective, randomized, controlled, multicentered U.S. IDE trial is currently underway to assess outcomes following implantation of second generation trabecular micro-bypass stents in subjects with mild to moderate open angle glaucoma (OAG) and cataract. The goal is to evaluate the safety and efficacy of stent implantation in conjunction with cataract surgery vs. cataract surgery alone through 24 months.

Methods: The iStent inject (Glaukos) is designed with outlet lateral lumens to enhance aqueous aqueous flow from the anterior chamber. The design of the G2-M-IS injector is to enable delivery of two stents using one insertion instrument. Previous reports from two initial studies showed IOP ≤ 21 mmHg without ocular hypotensive medication achieved in a higher proportion of subjects with stent implantation during cataract surgery vs. cataract surgery alone through two years with favorable long-term safety. This subsequent large-scale U.S. IDE study enrolled subjects with mild to moderate OAG, IOP ≤ 24 mmHg on 1-3 medications and cataract eligible for surgery, and post-medication IOP washout of 21 mmHg to 36 mmHg and 3 mmHg higher than medicated IOP. Subjects were randomized 3:1 to the treatment group (cataract surgery with implantation of two iStent inject devices) or control group (cataract surgery only) following successful cataract surgery.

Results: A total of 33 subjects have been randomized to date. No intraoperative adverse events have been reported. Preoperative mean IOP was 17.9 ± 4.1 mmHg on an average of two medications and 23.2 ± 2.2 mmHg after medication washout. No intraoperative adverse events have been reported. Three postoperative adverse events of IOP ≥ 10 mmHg vs. baseline have been reported. Subject enrollment/follow-up is continuing.

Discussion: Initial findings from this U.S. IDE study of second generation stents are encouraging.

Conclusions: Long-term positive outcomes from earlier studies and initial data from this study provide the basis for continued enrollment and follow-up. Postoperative results from an updated set of data will be presented.

38. Ex-press versus Trabeculectomy

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Purpose: To compare the success and complication rates of patients with glaucoma who had an Ex-PRESS mini glaucoma shunt device implantation (Optonol, Ltd., Neve Ilan, Israel) to those who had conventional trabeculectomy.

Methods: The records of 21 eyes of 20 patients who had Ex-PRESS implants and 21 eyes of 16 patients who had trabeculectomy were reviewed. The mean ages were 69.6 (± 13.0) years in the Ex-PRESS cohort and 75.5 (± 7.3) years in the trabeculectomy cohort. All primary cases between 2009 and 2011 performed by LFR, JMR, or JY were reviewed. Cases involving previous surgery (except clear-cornea cataract surgery), neovascular and uveitic glaucoma were excluded.

Results: The complete success rates were 11/21 (52%) and 13/21 (67%) in the Ex-PRESS and trabeculectomy cohorts, respectively (P=0.53). The qualified success rates of the Ex-PRESS and trabeculectomy cohorts were 15/21 (71%) and 17/21 (81%), respectively. The intraocular pressure at 1 year follow-up was 12.1 mmHg in the Ex-PRESS cohort and 11.5 mmHg in the trabeculectomy cohort (p=0.69). There was no significant difference in the number of post-operative visits in the first 3 months (p=0.15), but the number of postoperative IOP-lowering medications for the Ex-PRESS and trabeculectomy groups was 1.05 and 0.29, respectively (p=0.03). At least one complication occurred in 13 eyes in the Ex-PRESS cohort and in 10 eyes in the trabeculectomy cohort (P=0.54).

Discussion: In this small retrospective review comparing success and complication rates of the Ex-PRESS mini-shunt with conventional trabeculectomy, statistically significant differences between the two techniques was not measured. There was a trend toward fewer postoperative ocular hypertensive medications required in the trabeculectomy group.

Conclusions: A prospective, randomized study with a larger number of patients and long-term follow-up is necessary to assess the results of the present study.

39. Trans-Scleral Diode Cyclophotocoagulation (TDCPC) Scleral Burns within Areas of Peri-Limbal Conjunctival Melanosis

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Purpose: We report 2 cases of scleral burns in adults > 40 years old in areas of conjunctival melanosis with no prior trauma or congenital glaucoma.

Methods: A retrospective chart review (September 2005 - October 2012) of 175 consecutive patients by the same surgeon (SS) in whom scleral burns occurred during standard TDCPC was reviewed. Each case used a new fiberoptic G-Probe. Average laser parameters used: 1750-1900 mW; 2500 msec; 27-30 spots per eye.

Results: 360 degree burns occurred within the melanosis of a patient of Indian decent. A second black patient developed a seidel (-) scleral burn within the melanosis. G probe underside had pigment debris noted at point of indentation. Despite use of a new G probe a 2nd burn occurred in a similar fashion in an untreated area. Discussion: The literature suggests scleral thinning and burns following TSDCPC occur in younger age < 30(1), high energy settings or reuse of the G-probe (2). The diode laser energy is absorbed within the melanin of the ciliary body (3). We believe that occurrence of conjunctival melanosis increases susceptibility of scleral burns from the concentrated energy in such areas due to absorption by the surface melanin during G-probe placement.

Conclusions: In areas of peri-limbal melanosis, the G-Probe should be inspected after each application, any debris removed and the surface be kept wet with saline to decrease risk of scleral burns.

References

1. Morales J et al. Scleral Thinning After Laser Treatment J. Ophthalmic Surg Lasers Imaging 2007;38:301-306
2. Gupta V et al. Inadverent sclerotomy with encysted bleb following trans-scleral contact diode laser cyclophotocoagulation Clinical and Experimental Ophthalmology 2006; 34: 86-87
3. Schuman JS et al. Energy levels and probe placement in contact transscleral semiconductor diode laser cyclophotocoagulation in human cadaver eyes. Arch Ophthalmol 1991; 109:1534-1538

40. Glaucoma Tube: Repositioning into Pars Plana for Refractory Malignant Glaucoma

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Purpose: Describe successful treatment of refractory malignant glaucoma by rerouting glaucoma tubes into the pars plana.

Methods: Case report of one patient.

Results: 47 year old male with a history of neovascular glaucoma and subsequent chronic angle-closure glaucoma who was status post 2 glaucoma drainage devices. He developed pupillary block. Laser iridotomy was performed without complications. He subsequently developed ciliary block glaucoma that was refractory to YAG to the anterior hyaloid. He underwent pars plana vitrectomy with successful control of his intraocular pressure. After 2 weeks, the malignant glaucoma recurred. He underwent repositioning of the tubes into the pars plana with successful control of his intraocular pressures.

Discussion: This is the second case of a tube implant in the pars plana and the first reported incidence of repositioning glaucoma tubes into the pars plana cavity to treat ciliary block glaucoma. Tube placement into the pars plana at the same time as pars plana vitrectomy has been reported previously.[1] There is one reported case[2] of an eye having recurrent ciliary block despite having undergone vitrectomy. It is possible that our patient developed an inflammatory membrane over the iridotomy; however, the iridotomy was patent. Our patient had had a complete vitrectomy and removal of the anterior hyaloid, as well as enlargement of his iridotomy with the vitreous cutter probe through the pars plana.

Conclusions: In rare cases of ciliary block glaucoma refractive to YAG hyaloidotomy and vitrectomy, placement of glaucoma drainage devices is a reasonable alternative.

References

1. Azuara-Blanco A, Katz L, Gandham S, et al. Pars plana tube insertion of aqueous shunt with vitrectomy in malignant glaucoma. *Arch Ophthalmol.* 1998; 116; 808-810.
2. Zacharia P, Abboud E. Recalcitrant malignant glaucoma following pars plana vitrectomy, scleral buckle, and extracapsular cataract extraction with posterior chamber intraocular lens implantation. *Ophthalmic Surg Lasers.* 1998 ;29:323-327.

41. One Year Outcomes of the Trabecular Micro-bypass Stent with Phacoemulsification and Risk Factors for Failure

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Purpose: To determine the efficacy of the istent trabecular micro-bypass stent in combination with cataract surgery and examine risk factors associated with failure.

Methods: Retrospective cohort study. We included a total of 96 patients (116 eyes) with mild or moderate glaucoma controlled on one or more medications, who had undergone cataract surgery with implantation of 2 iStent by two glaucoma surgeons between October 2009 and April 2012. Patients with primary open angle glaucoma, normal tension glaucoma, pseudoexfoliative glaucoma, uveitic glaucoma and pigment dispersion syndrome were included. 83 patients completed 6 months of follow-up and 51 patients completed 1 year of follow-up. We definded surgical success as IOP ≤18 and 20 % reduction with or without medications, or IOP ≤ 18 and decreased number of medications. A secondary outcome measure was IOP ≤ 18 without medications.

Results: The success rate 1 year after surgery was 81%. 56% had IOP ≤ 18 without medications. Mean pre-op IOP was 17,75 ± 4,16 mmHg and mean post-op IOP was 15,45 ± 3,48 mmHg with a mean reduction of -2,6 ±4,2 mmHg ($p<0,001$) . Mean number of pre-op medications was 2,35 ± 1,25 and mean number post-op medications was 0,65 ± 1,08 with a mean reduction of -1,5 ± 1,2 ($p<0,001$). Previous laser trabeculoplasty was associated with a higher risk of failure in a univariate analysis. Surgery was equally effective in all subtypes of glaucoma and was also equally effective in mild and moderate glaucoma according to pre-op mean defect. Number of pre-op medications, pre-op IOP and use of medications in the contralateral eye did not affect the success rate.

Discussion: The Trabecular micro-bypass stent combined with phacoemulsification was an effective procedure to decrease use of medications and/or decrease intraocular pressure. Previous laser trabeculoplasty may adversely affect the outcome. Subtype of glaucoma did not affect the success rate.

Conclusions: In patients with controlled mild or moderate glaucoma, the trabecular micro-bypass stent combined with phacoemulsification results in a decrease dependance on medications and/or a decrease in intraocular pressure. Patients with previous laser trabeculoplasty may be at higher risk of failure.

Poster Abstracts

Friday, March 1, 2013

Imaging, IOP and Outflow

42. Continuous Likelihood Ratios for Glaucoma Diagnosis Using Spectral Domain Optical Coherence Tomography

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Purpose: To present and validate a new methodology for calculating continuous likelihood ratios (LRs) for glaucoma diagnosis with retinal nerve fiber layer (RNFL) thickness measurements from spectral domain optical coherence tomography (SDOCT).

Methods: 262 eyes of 187 patients with glaucoma and 190 eyes of 100 control subjects were included in the study. Subjects were recruited from the Diagnostic Innovations Glaucoma Study (DIGS). Continuous LRs for glaucoma diagnosis were estimated for specific global RNFL thicknesses using a new methodology based on estimating the tangents to the Receiver Operating Characteristic (ROC) curve. Continuous LRs were compared to the standard approach of categorical LRs derived from the classification provided by the Spectralis software. Receiver operating characteristics (ROC) curves were then used to compare the diagnostic ability of the post-test probability values calculated using the continuous and categorical methods.

Results: Receiver operating characteristic (ROC) analysis comparing continuous and categorical LRs showed that the continuous approach performed significantly better (area under ROC curves of 0.88 vs. 0.79, respectively, P = 0.014) for discriminating glaucomatous from healthy eyes.

Discussion: This is the first study to report LRs for continuous values of a marker in glaucoma. Our results may have significant implications in the diagnostic process of glaucomatous damage, as specific post-test probabilities of disease can be assessed for individual RNFL values. The printout of the Spectralis SDOCT displays classifications of RNFL parameters according to comparisons to a normative database. This categorization can lead to important loss of information, as widely different RNFL thicknesses are potentially given the same diagnostic weight. Using the conventional approach, an eye would be classified as abnormal if its RNFL thickness is below the 1% cut-off. Two eyes with RNFL thicknesses of 73µm and 65µm would both be categorized as outside normal limits using the conventional approach with no distinction made between them. However, considering the same pretest probability of 30% for both eyes, for example, the use of continuous likelihood ratios would lead to different post-test probabilities of 83% and 97%. The same reasoning can be applied to eyes classified as within normal limits. For example, two eyes with RNFL thicknesses of 81µm and 110µm would both be categorized as within normal limits. However, considering the same pretest probability of 30% for both eyes, the use of continuous likelihood ratios would lead to very different post-test probabilities of 51% and 5%. Clearly, these eyes should not be seen as having the same probability for the presence of the disease, as it would be implied by the categorical approach.

Conclusions: Calculation of continuous LRs resulted in more accurate estimation of post-test probability of disease and improved the discrimination of glaucomatous from control eyes compared to the categorical approach.

43. In Vivo Evaluation of Peripheral Laminar Deformation in Glaucoma Using EDI OCT and Algorithms for Shadow Removal and Contrast Enhancement

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Purpose: The peripheral lamina cribrosa (LC) is often invisible on optical coherence tomography (OCT) imaging. We characterized the peripheral laminar deformation in glaucoma in vivo quantitatively and qualitatively using OCT images of improved quality for the LC.

Methods: Serial horizontal and vertical enhanced depth imaging (EDI) OCT optic nerve head scans (interval between scans ~30 μm) were prospectively obtained for glaucoma patients and healthy subjects. All EDI OCT images were enhanced further using algorithms for shadow removal and contrast enhancement. For one eye of each subject, the anterior LC insertion depth was measured at 3 points in each quadrant (reference plane: Bruch's membrane opening) (Fig A and B). The mean LC insertion depth in each quadrant was compared between the two groups. Anterior laminar surface shape in the LC insertion area was compared between the two groups.

Results: 52 patients with glaucoma (mean age, 68±11 years; mean visual field mean deviation, -16.2±3.1 dB) and 50 healthy subjects (mean age, 60±11 years) were included. The mean anterior LC insertion depth was significantly greater in the glaucoma group in the superior and inferior quadrants (p=0.027 and p0.3) (Fig C). In all healthy eyes and 19/52 glaucomatous eyes, the anterior laminar surface assumed a slightly upward sloping or a flat shape toward the insertion point. In 33/52 glaucomatous eyes, the anterior laminar surface in the insertion area assumed a wedge, step or bayonet shape focally (Fig D-I), which appeared to evolve into laminar disinsertion with various shapes as glaucoma advances (Fig J-M).

Discussion: The superior and inferior LC insertion regions were posteriorly displaced in glaucoma. In focal areas of the peripheral LC, the anterior laminar surface assumed characteristic deformation patterns.

Conclusions: Characteristic peripheral laminar deformation may be used for detecting or monitoring glaucomatous optic nerve head damage.

Reference

Girard MJ, Strouthidis NG, Ethier CR, Mari JM. Shadow removal and contrast enhancement in optical coherence tomography images of the human optic nerve head. Invest Ophthalmol Vis Sci 2011;52:7738-48.<br Support: John and Dorothy Roberts Research Fund of

44. Three-dimensional Imaging of the Lamina Cribrosa to Assess Structure and Function in Glaucoma

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Purpose: Advances in optical coherence tomography (OCT) allow *in vivo* imaging of the three-dimensional (3D) structure of the lamina cribrosa (LC). We aim to (1) describe *in vivo* 3D structural characteristics of the LC using OCT and (2) evaluate its spatial relationship with visual field (VF) function and retinal nerve fiber layer (RNFL) loss.

Methods: Healthy and glaucoma subjects underwent comprehensive ocular examination, VF testing (Humphrey Field Analyzer; Carl Zeiss Meditec, Dublin, CA), and scanning by commercially available spectral-domain OCT (SDOCT) devices (Spectralis, Heidelberg Engineering, Heidelberg, Germany; Cirrus HD-OCT, Carl Zeiss Meditec, Dublin, CA) and a multimodal adaptive optics imaging system with OCT and scanning laser ophthalmoscopy (SLO) (Physical Sciences Inc., Andover, MA). Morphology of the LC was subjectively and qualitatively evaluated on cross-sectional and 3D reconstructed images and compared to VF and RNFL loss.

Results: Morphologic indentation in the anterior LC surface was observed using both commercial SDOCT and the multi-modal device with limited correspondence with VF or RNFL abnormalies. This discrepancy was noted with anterior LC surface indentations identified in healthy control and glaucoma subjects that do not correspond to locations of VF and RNFL loss. Indentation of the anterior laminar surface along with pore size, shape and orientation varies among healthy and glaucomatous eyes.

Discussion: 3D imaging permits detailed characterization of LC structure. 3D visualization of the LC provides additional and pertinent structural information compared to cross-sectional imaging. A high level of complexity and variability exists in the LC, limiting correspondence with perimetry and RNFL loss. Further investigation, including quantification of 3D LC morphology, may elucidate the structure-function relationship of the LC in glaucoma.

Conclusion: 3D imaging studies permit a detailed analysis of the LC, suggesting that certain LC structural abnormalities may not be associated with detectable VF scotomas or RNFL thinning.

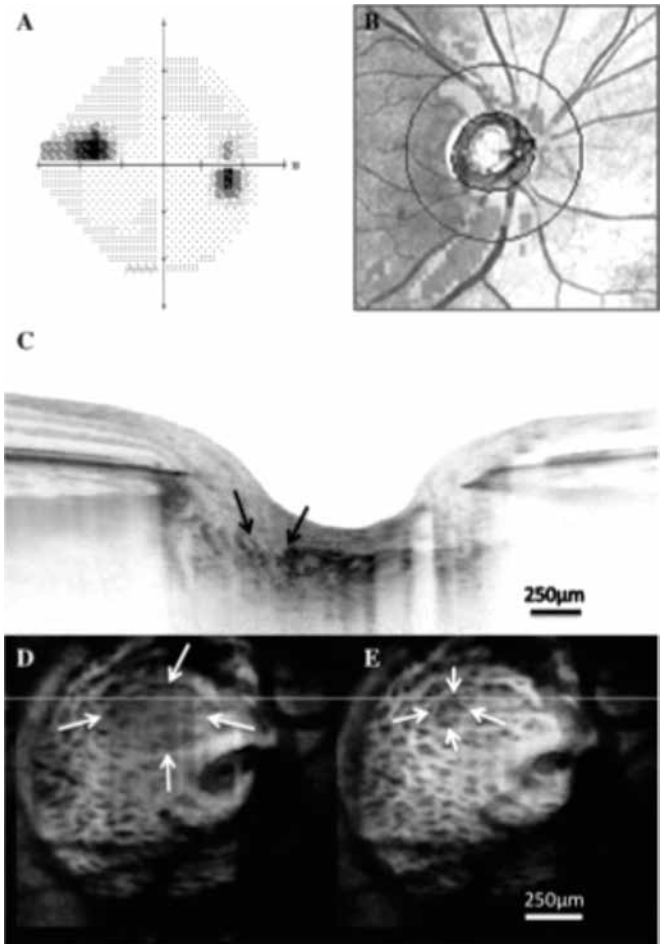

Figure: (A) Visual field defect in the superior nasal region corresponding to the (B) Cirrus HD-OCT RNFL thinning in the temporal inferior region. (C) Spectralis show a focal indentation with a maximal length of 171µm in the superior temporal region (black arrows). (D-E) Two C-mode of the multi-modal AO-OCT, with (E) 35µm deeper in the ONH, show a substantially wider indentation of 425µm (white arrows). The white line denotes the scanning location for (C) Spectralis.

45. A Thinner Iris at Baseline Predicts Greater Changes in Iris Curvature and Anterior Chamber Dimensions after Prophylactic Laser Peripheral Iridotomy

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Purpose: To evaluate the association between baseline measurements of iris thickness and changes in anterior chamber volume (ACV), anterior chamber area (ACA), and iris curvature (ICURV) after prophylactic laser peripheral iridotomy (LPI) in nonglaucomatous subjects with anatomically narrow angles.

Methods: Anterior segment optical coherence tomography images obtained before and after LPI were analyzed. Differences in preoperative and postoperative measurements of ACV, ACA, and ICURV were compared by paired Student's t-tests. Univariate and linear mixed-effects regression models were used to examine the associations between baseline values of iris thickness measured at 2000m from the scleral spur (IT2000) and maximal iris thickness (ITM) and the post-LPI changes in ACA, ACV, and ICURV.

Results: Eighty-four eyes of 52 nonglaucomatous subjects with anatomically narrow angles were included in the analysis. ICURV significantly decreased, while both ACA and ACV significantly increased following LPI (all $P<0.0001$). ICURV significantly decreased from a pre-LPI average of 0.34 ± 0.11 mm to a post-LPI average of 0.17 ± 0.12 mm. ACA significantly increased from a pre-LPI average of 17.42 ± 2.62 mm^2 to a post-LPI average of 18.53 ± 2.75 mm^2, while ACV significantly increased from a pre-LPI average of 113.14 ± 22.85 mm^3 to a post-LPI average of 127.39 ± 24.65 mm^3. Lower baseline measurement of IT2000 was significantly associated with greater postoperative increase in ACV in the univariate regression model ($P<0.05$), but the association was only borderline significant in the linear mixed-effects regression model ($P<0.10$). Lower baseline measurement of IT2000 was also significantly associated with greater postoperative decrease in ICURV in both univariate and linear mixed-effects regression models (both $P<0.05$). The association between lower baseline measurement of ITM and greater postoperative increase in ACA was borderline significant in the univariate regression models ($P<0.10$) but gained significance after adjusting for potential confounding factors in the linear mixed-effects regression models ($P<0.05$). In both univariate and linear mixed-effects regression models, lower baseline measurement of ITM was found to be significantly associated with greater postoperative increase in ACV and greater postoperative decrease in ICURV (all $P<0.05$).

Conclusions: Our results showed a low baseline value of iris thickness to be associated with a greater decrease in ICURV and increases in both ACV and ACA after LPI. This suggests that eyes with thin iris undergoing LPI were more likely to exhibit greater magnitude of change in terms of flattening of the convex iris (i.e., ICURV) and enlarging of the anterior chamber dimensions (i.e., ACV and ACA).

46. Effect of Laser Peripheral Iridotomy on Trabecular-Irido Circumference Volume in Primary Angle Closure Eyes

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Purpose: Trabecular-irido circumference volume (TICV) is defined as the integrated volume of the irido-corneal angle over 360 degrees as calculated from 256 angle scans. TICV500 and TICV750 are defined based on the distance from the scleral spur landmark (SSL) similar to trabecular-irido surface area (TISA500 and TISA750). TICV can and only now be calculated due to the large number of rapidly obtained scans taken with swept-source Fourier domain anterior segment optical coherence tomography (ASOCT). The purpose of this study is to evaluate the effect of laser peripheral iridotomy (LPI) on TICV at 500 and 750 μm (TICV500 and TICV750) in primary angle closure (PAC) eyes.

Methods: Fifteen subjects with PAC eyes scheduled for LPI were recruited from the Robert Cizik Eye Clinic, The University of Texas Health Science Center at Houston. Ocular examination including slit lamp, intraocular pressure (IOP) and gonioscopy was performed. Eyes were imaged by both 2D and 3D modes with anterior angle scan type using the CASIA SS-1000 ASOCT (Tomey, Nagoya, Japan), preoperatively and 3 months postoperatively. An experienced reader used the Anterior Chamber Analysis and Interpretation (ACAI, Houston, Texas) software to identify the SSLs on higher resolution 2D images (both horizontal and vertical scans). Then, the ACAI software automatically transferred the SSLs to the same location on the 3D images based on which TISA500, TISA750, TICV500 and TICV750 were calculated. The IOP, TISA and TICV before and after LPI were computed and compared using paired *t*-test.

Results: Twenty-seven PAC eyes with gonioscopy grade A or B from 15 participants were enrolled in the study. Eleven (73%) were female. Two (13%) were Asian; 4 (27%) were White; 3 (20%) were Black; and 6 (40%) were Hispanic. The mean age was 59.8 (± 8.5) years. Table 1 summarizes the change in IOP, average of 0 and 180 degrees TISA, and TICV values pre- and post-LPI.

Discussion: TISA500 and TISA750 were similar to that reported elsewhere in similar populations. TICV500 and TICV750 both significantly increased after LPI. Although average IOP decreased after LPI, it was not statistically significant.

Conclusions: TICV500 and TICV750 can be calculated and used to measure volumetric changes that occur after LPI in PAC eyes. This new parameter should be further investigated to elucidate its value in the management of PAC.

Table 1: IOP, TISA and TICV Pre- and Post-LPI

	IOP (mm Hg)	TISA500 (mm^2)	TICV500 (μl)	TISA750 (mm^2)	TICV750 (μl)
Pre-LPI	16.4 ± 3.7	0.029 ± 0.022	0.030 ± 0.025	0.068 ± 0.037	0.120 ± 0.087
Post-LPI	14.5 ± 1.7	0.039 ± 0.027	0.046 ± 0.024	0.092 ± 0.047	0.186 ± 0.082
Change	-1.8 ± 3.1	0.015 ± 0.025	0.022 ± 0.015	0.036 ± 0.039	0.085 ± 0.055
(P value)	(0.0649)	(0.0462)	(0.0002)	(0.0061)	(0.0001)

47. Optimizing Detection of Glaucoma with RNFL Measurements

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Purpose: A 3.4 mm RNFL measurement circle has been traditionally used to measure the peripapillary RNFL thickness. There is evidence in monkeys that an equidistant measurement ellipse can lead to decreased intersubject variability. The exact location of RNFL measurements is also subject to the ocular optical magnification. Similarly, the angle of the fovea-disc (FoDi) axis can potentially affect structure-function relationships and measurement variability. The aims of this study are to explore whether: 1) RNFL measurements along an ellipse equidistant from the disc border, or 2) correction for optical magnification of individual eyes, or 3) adjusting RNFL measurements based on the FoDi axis, would lead to decreased measurement variability, stronger structure-function relationships, or better discrimination of glaucoma from normal eyes.

Methods: 48 control subjects (87 eyes) and 53 patients (88 eyes) with perimetric glaucoma were prospectively recruited and underwent OCT imaging (Optic Disc and Macula Cubes) on Cirrus HD-OCT. The 200x200 RNFL thickness matrices were exported and custom software was used to measure the RNFL thickness (unadjusted data and data adjusted for ocular magnification with Bennett's formula) along a 3.46 mm circle and an ellipse concentric with disc border (i.e., the edge of the Bruch's membrane) with the same circumference as the 3.46 mm circle. The FoDi angle was measured after overlapping macula and disc cube en face images. Area under the curves (AUCs) for TSNIT graphs and average RNFL (and SD) were compared for different sampling methods. Global structure-function relationships and the ability to discriminate glaucoma from normal eyes were compared (with ROC curves).

Results: Average MD was 0.0±1.3 and –2.7±3.3 dB in the control and glaucoma groups, respectively. The AUC for the measurement ellipse was highly correlated with the AUC for the 3.46mm circle (r^2=0.992). Partial AROC for the average RNFL corrected for magnification was worse than uncorrected RNFL at specificity >0.90 (p=0.03). Global structure-function relationships were similar (p>0.05) and 95% prediction intervals for sectoral RNFL measurements in normal subjects were not lower with an elliptical measurement pattern or after correction for magnification or the FoDi axis.

Discussion: An elliptical RNFL measurement pattern, correction for optical magnification, or for the FoDi angle did not improve RNFL measurement variability in normal subjects or the ability to detect early glaucoma.

Conclusions: The currently used standard 3.46mm RNFL measurement circle seems to be adequate for clinical purposes. Other anatomical features that could improve variability in RNFL measurements (such as vascular anatomy) need to be further explored.

48. Optic Disc Area Variations in Caucasian, Chinese, African, Hispanic, and Filipino Using Fundus Photography

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Purpose: This retrospective cross-sectional study examines optic disc area in Caucasian, Chinese, African, Filipino and Hispanic using fundus photographs to provide an estimation of the relative variability in optic disc area among the ethnic groups.

Methods: Medical records from patients who had received consecutive fundus photography from a university-based general ophthalmology clinic were reviewed. The following clinical data were retrieved: age, sex, glaucoma status, lens status, spherical equivalent, and ethnicity. Optic disc area was calculated from fundus photographs based upon a conversion plot developed from a line of best fit when comparing optic disc area between fundus photography and Heidelberg Retina Tomography in a randomly selected subset of patients. Differences in age, sex ratio, spherical equivalent, and optic disc area among the ethnic groups were examined. Univariate regression analyses were performed with optic disc area as the dependent variable and age, sex, lens status, glaucoma status, and spherical equivalent as independent variables. Each factor found to be significant in the univariate regression analyses were reassessed with linear mixed-effects regression models, and adjusted for other significant factors. Factors that were significantly associated with optic disc area in the linear mixed-effects regression analyses were subsequently controlled for in the linear mixed-effects regression models assessing the racial differences in optic disc area among the five ethnic groups.

Results: A total of 305 patients were available in which 574 eyes were included in the analysis. The mean and standard deviation of the optic disc area were 2.16 ± 0.412 mm^2 for Caucasian, 2.30 ± 0.568 mm^2 for Chinese, 2.31 ± 0.411 mm^2 for Filipino, 2.38 ± 0.401 mm^2 for African, and 2.40 ± 0.382 mm^2 for Hispanic. Optic disc area, age, and spherical equivalent significantly differed among the ethnic groups by Kruskal-Wallis test (P<0.001). Sex ratio was significantly different among the five ethnic groups by Chi-square test (P= 0.002). Spherical equivalent and glaucoma status were significantly associated with optic disc area in both univariate (P<0.005) and linear mixed-effects regression analyses (P<0.05). Analyses of racial differences in optic disc area by linear mixed-effects regression model, adjusted for age, sex, glaucoma status, spherical equivalent, and use of both eyes in the same subject were not significant among the African, Hispanic, Filipino, and Chinese groups (P>0.05). However, the comparison of Caucasian ethnicity to all other ethnicities was significant (P<0.005).

Conclusions: Optic disc area was significantly smaller in Caucasian compared to all the other ethnic groups studied. Optic disc area differences among the non-Caucasian ethnic groups were not significant. Spherical equivalent and glaucoma status were associated with optic disc area.

49. Artifacts in Spectral Domain Optical Coherence Tomography Imaging in Glaucoma

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Purpose: Spectral Domain Optical Coherence Tomography (SD-OCT) is commonly used in the evaluation of glaucoma. Recognition of SD-OCT artifacts and their sources is critical for appropriate image interpretation. This study systematically reviewed the frequency and distribution of SD-OCT artifacts in both the retinal nerve fiber layer scans (RNFL) and macular scans in glaucoma patients.

Methods: SD-OCT images of 277 consecutive patients were obtained. Both the source images and final printout images of the macular thickness (n=131) and RNFL scans (n=277) were reviewed by an experienced glaucoma specialist (SA). Causes of artifact were classified as due to ocular pathology, technician error, software error or signal strength. Artifacts due to ocular pathology were further classified by primary diagnosis.

Results: Of the 131 macular thickness images, 43 artifacts (32%) were found in 37 scans. Of the 277 RNFL images, 63 artifacts (22%) were found in 55 scans. Of the macular thickness image artifacts, 22 (51%) were related to ocular pathology, 13 (30%) to software error, 6 (14%) to signal strength and 2 (5%) to technician error. Of the RNFL image artifacts, 36 (57%) were related to ocular pathology, 12(19%) to software error, 12 (19%) to technician error and 3 (5%) to signal strength. The most common cause of both macular and RNFL ocular pathology was epiretinal membrane (73%). Most of the artifacts (83% of macular, 87% of RNFL) were obvious from the final printout. Clinical misinterpretation artifacts due to masqueraders of glaucoma as well as the other above artifacts are illustrated.

Discussion: Artifacts in macular and RNFL SD-OCT images were relatively common and most were easily identified on the final printout. Ocular pathology was the most common cause of artifact in both macular and RNFL SD-OCT. Re-acquiring the scans or manually correcting segmentation errors, though time consuming, may be needed for better clinical care. Continued improvements in software and segmentation algorithms may provide increasingly reliable quantitative thickness data.

Conclusions: As ophthalmic imaging becomes an increasingly common adjunct to the diagnosis and management of glaucoma, it is important for the clinician to be cognizant of the frequency and types of imaging artifacts. Raising awareness of obvious artifacts on the final printout can assist the clinician in avoiding erroneous interpretations. However, artifacts that are not obvious on the final printout remain a major concern and may lead to significant errors in clinical interpretation.

50. Flicker Chronoscopy: Agreement for Structural Glaucomatous Progression and Factors Associated with Progression

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Purpose: To evaluate agreement of flicker chronoscopy for structural glaucomatous progression and to determine factors associated with progression.

Methods: Two glaucoma fellowship-trained ophthalmologists, masked to temporal sequence of images, independently graded serial flicker chronoscopy images from one eye of a cohort of glaucoma patients for features of structural progression. Agreement between graders was determined, as was accuracy for determining the temporal order of images. After adjudication, simple and multiple logistic models were constructed to determine baseline variables associated with increased odds of progression.

Results: 50 of 103 (48.5%) included eyes/patients had at least one sign of structural progression. Temporal sequence was incorrectly determined in 14 of 206 (6.4%) cases. Interobserver agreements for identifying baseline photos (κ=0.9), global progression (κ=0.7), parapapillary atrophy (PPA) progression (κ=0.7), disc hemorrhages (DH) (κ=0.7), neuroretinal rim loss (κ=0.5) and retinal nerve fiber layer (RNFL) loss (κ=0.2) were calculated. Age was significantly associated with global (1.8; 1.3-2.6, p<0.001) (OR; 95%CI, significance) and PPA progression (1.7; 1.2-2.4, p=0.002). Lower corneal hysteresis (CH) was associated with global progression (0.78; 0.56-0.99, p=0.049) and RNFL loss (0.5; 0.3-0.9, p=0.02). Goldmann-correlated intraocular pressure (IOPg) (1.0, 0.7-1.4, p=0.9), visual field mean deviation (MD) (1.0, 0.9-1.0, p=0.2), and central corneal thickness (CCT) (0.9, 0.8-1.0, p=0.1) were not significantly associated with progression. On multivariable analysis, only age was associated with global progression (1.8; 1.2-2.5, p=0.002).

Discussion: Flicker chronoscopy demonstrated acceptable interobserver agreement in structural progression detection. CH and age were both associated with progression, but age was the only significant factor on multivariable analysis.

Conclusions: This report supports the use of flicker chronoscopy to determine structural progression and provides rationale to include CH as a variable of interest in future investigations of structural and functional progression.

51. The Perfusion Pressure in the Prelaminar Layer of the Optic Disc May Be Decreased by an Enhanced Pressure in the Central Retinal Vein

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Purpose: The prelaminar layer (PL) of the optic nerve head (ONH) is drained by the central retinal vein (CRV)[1]. The CRV pressure has hitherto been measured by instruments calibrated in arbitrary units or in grams[2]. The CRV doesn't pulsate when its intraluminal pressure is higher than the intraocular pressure (IOP), and under these conditions its perfusion pressure (PP) is generally underestimated. In this study we used a contact lens dynamometer calibrated in mmHg. The values obtained may serve in calculating the actual PP in the PL of the ONH.

Methods: Case control study. Subjects: Primary open angle glaucoma (POAG) n=27; age:69±9 years (arith.mean±std. dev.); m/f=7/20). Controls: n=27; age:68±10 years ; m/f=7/20. Measurement of the vein pulsation pressure (VPP) by contact lens dynamometry (Meditron, Voelklingen, Germany). IOP measurement: Goldmann applanation tonometry.

Results: Spontaneous pulsation of the CRV (yes/no): POAG: OD: 10/17; OS: 9/18. Controls: OD: 26/1; OS: 25/2. χ^2-test OD and OS: $p<0.05$. Pulsation pressure of the central retinal vein (VPP) (pressures in mmHg): POAG: OD: 16.8±5.0; OS: 17.7±6.3. Controls: OD: 11.9±3.8; OS: 11.8±3.6. Difference statistically significant: t-test: $p<0.01$ in OD and OS. Normal distribution. IOP: POAG: OD: 15.4±2.9; OS: 14.9±2.8. Controls: OD: 14.4±2.7; OS:14.4±2.8. Normal distribution. CRV Pressure higher than IOP: POAG: OD n=18, OS n=19. Controls: OD n=6, OS n=4. In these cases the CRV pressure was higher than the IOP (distributions skewed to the right): POAG: OD: 0.4;2.7;16.3 (Min;Med;Max), OS:0.3;4.0;23.0. Controls: OD: 1.0;2.0;6.0, OS: 1.0;1.5;3.0.

Discussion: As expected according the observed frequencies of pulsations[3] the average VPP was significantly higher in glaucoma patients than in controls. In 2/3 of our POAG patients the VPP values were higher than the IOP. In these cases the PP in the CRV may be calculated: PP= (MAP of ophthalmic artery) - VPP. In 1/3 of the patients this calculated PP was lower by at least 2.5 mmHg than assumed until now.

Conclusions: Measurement of the pressure in the CRV might provide a powerful clinical tool for estimating perfusion pressure in all forms of glaucoma.

References

1. Hayreh SS. The blood supply of the optic nerve head and the evaluation of it - myth and reality. *Prog Retin Eye Res*. 2001;20:563-593.
2. Balaratnasingam C, Morgan WH, et al. Value of retinal vein pulsation characteristics in predicting increased optic disc excavation. *Br J Ophthalmol*. 2007;91:441-444.
3. Nicolela MT. Retinal vein pulsation predicts increasing optic disc excavation. *Br J Ophthalmol*. 2007;91:405-406.

52. Correlation of Brain Volumes and Patient-Reported Visual Disability in Glaucoma

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Purpose: To explore the relationship between brain volume, disease severity, and patient-reported visual disability in glaucoma.

Methods: 15 glaucoma patients with varying levels of clinical severity and 15 age-, race- and gender-matched controls underwent high resolution T1-weighted anatomical MRI brain scans. Exclusion criteria included neurological disease, another disorder which could affect the visual field, and score of less than 25 on the mini-mental status exam. The scans were analyzed with an automatic voxel-based morphometry technique to measure the volumes of 93 brain structures. The volumes of all brain structures in the group of 15 glaucoma patients were correlated with the peripheral vision subscale score and composite score of the National Eye Institute Visual Functioning Questionnaire (VFQ-25). For those structures with significant relationships, a linear multivariate regression analysis with average glaucoma staging system (GSS) score and age as covariates was conducted to further delineate the relationship between brain volume, clinical disease severity, and patient-reported visual disability.

Results: The volumes of 7 brain structures had a significant correlation with either the peripheral vision subscale score or composite score of the VFQ-25 (left lingual gyrus, right and left cuneus gyri, left precuneus, right lateral occipitotemporal gyrus, right middle temporal gyrus, right perihinal cortex). In multivariate regression analysis, neither age nor any of the brain volumes were significant predictors of VFQ-25 scores. Average GSS score was a significant predictor in 10/14 models ($p<0.03$).

Discussion: We previously demonstrated that disease stage is independently associated with the volume of many cortical structures in patients with glaucoma. In this study we found that brain volume is correlated with patient-reported visual disability but that this association is not significant in multivariate analysis. GSS score, a measure of visual field damage, is independently associated with both brain volume and patient-reported disability and likely accounts for the apparent correlation between these two variables. More subjects will be needed for a definitive conclusion.

Conclusions: Further research is needed to determine the relationship between cortical structure, disease progression and visual disability in glaucoma.

53. 80 Mhz Iultrasound Imaging of Schlemms Canal and Angle in Pediatric Population With and Without Glaucoma

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Purpose: To report the use of 80 MHz iUltrasound machine (US) to study the angle anatomy including the identification of Schlemm's canal(SC) in pediatric population with and without congenital glaucoma.

Methods: A total of 19 eyes of 10 patients without glaucoma and 8 eyes of 5 patients with congenital glaucoma (12 eyes) were prospectively enrolled between 2009-2012. Under anesthesia, the diameter and location of the SC and the other angle structures were measured. This study was approved by Tulane IRB.

Results: Among those without glaucoma, there were 5 girls and 5 boys. There were 2 boys and 1 girl under the age of 2 years and the rest older than 2 years. The average age was 6.89 years (SD 6.55). The average canal diameter for the entire group was 0.142 mm (0.03; range 0.09-0.196) ; that for < 2 years was 0.103 (0.08) (range 0.09-0.115) and that for > 2 years was 0.161 (0.02) (range 0.11 – 0.196) which was statistically significant ($p<0.001$ mann-whitney two-tailed test). Among the congenital glaucoma group, the average age was 1.35 years (SD 1.52); the mean preop IOP was 44 (11.14) and mean post op IOP at 2.4 years (1.5) was 18 mm Hg (4.62). The corneas were clear and angle wide open in 3 eyes. Goniotomy was successfully performed with poor IOP response on the first patient who had clear corneas and open angles but the canal was not visible on ultrasound. This patient needed AGV following failed goniotomy. Canaloplasty was successfully performed on the other two where the canal was clearly visible on ultrasound (0.065 mm diameter). The rest of the 5 eyes had either cloudy cornea or abnormal angles and no visible canal on ultrasound. They were successfully treated with primary AGV.

Discussion: The angle anatomy and SC using US has not been documented in pediatric population. Our study suggest that SC diameter may increase with age. US may give information that may help in the surgical decision making. Goniotomy may work in patients with clear cornea and open angle and the canal is easily identifiable on ultrasound. Ahmed valve may be indicated in patients with abnormal angle or when the canal is absent.

Conclusions: The SC is significantly smaller in pediatric population less than 2 years. US of the angle and SC may help in surgical decision making of congenital glaucoma . These findings have to be confirmed with further studies.

Reference

F. A. Irshad, R. S. Ayyala, M.S. Mayfield, D. Zurakowski. Variation in Schlemm Canal Size and Location by Ultrasound Biomicroscopy. *Ophthalmology.* 2010 May;117(5):916-20.

54. Ultrasound Biomicroscopy Findings after Supracilliary Shunt Placement in Patients with Glaucoma

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Introduction: Supracilliary (SC) shunts are emerging as an option for intraocular pressure (IOP) control in patients with glaucoma. There use creates an alternate pathway for efflux of fluid from the eye without formation of a filtering bleb as seen after other types of glaucoma surgery. The absence of an external easily visible bleb raises the question of the natural history of fluid flow in this space over time and how this relates to the IOP. Ultrasound biomicroscopy (UBM) is a non invasive, cost effective way of imaging structures in the eye in real time.Its use in this patient group provides an insight into the natural progression of fluid following the placement of these devices. The purpose of the study was to evaluate for the presence and extent of a posterior fluid lake as well as it's correlation with IOP response over time.

Methods: Serial ultrasounds were performed on patients following SC shunt placement. A deep focus handpiece for iscience intervention (Mento Park, CA USA) scanner was used for all scans. Scans were done at placement site and at 12, 9, 6 and 3 o clock at the one week, one month time points and on subsequent visits after that. The presence of fluid in the supracilliary space, fluid height over time as well as the presence of fluid in all quadrants was observed over time. The ultrasound scans were classified as grade 0 if no fluid was present around the device, grade 1 with minimal fluid, grade 2 with a notable fluid lake around and posterior to the device in one quadrant and grade 3 if fluid was present in more than one quadrant. Other data including patient age, sex and IOP at baseline and on day of UBM was collected.

Results: A total of 4 patients had serial UBM after SOLX gold shunt placement. All patients had grade 3 flow in the first week of device placement with 45% reduction in mean IOP from baseline at week 1. Mean preoperative IOP was 25.9mmhg. Subsequent UBM showed grade 2-3 flow in all patients until post op week number 3-4. There was a corresponding decline in the extent of flow to grade 0 to 1 after this time frame with reduction in percentage decrease in IOP at this time points.

Discussion: Serial UBM shows fluid flow into the Supracilliary space that may initially be present in all quadrants and then becomes more localised with time. The presence of a fluid lake in the late post period as well as percentage change in IOP correlates with the function of the device.

Conclusions: Ultrasound biomicroscopy is a viable way of following patient response after supracilliary drainage device placement. It provides a way of assessing function of the device over time in addition to IOP measurements.

References

1. RH Silverman. High resolution ultrasound imaging of the eye-a review. Clin. Eperiment. Ophthalmo.> 2009 January:37(1):54-67
2. Schmidt et al. New concepts for glaucoma implants- controlled aqueous humor drainage, encapsulation prevention and local drug delivery. Curr pharm Biotechnol. 2012 October 19 (Epub ahead of print).
3. Shohan N, Saheb I, ahmed I, Vold S et al. Cypass microstent anatomic outcomes study. ASCRS 2012

55. Optic Disc Hemorrhage after Phacoemulsification in Patients with Glaucoma

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Purpose: To determine if supra-physiologic short-term intraocular pressure (IOP) fluctuations experienced during phacoemulsification and in the early postoperative period are associated with development of optic disc hemorrhage (ODH) in patients with glaucoma.

Methods: Retrospective review of consecutive glaucoma patients undergoing phacoemulsification as a sole procedure, performed between August 1996 and July 2009 at the University of Washington, and who had at least 3 visits in the year prior to cataract surgery and at least 5 visits in the year following cataract surgery, including at least 3 visits in the 6 weeks immediately postoperatively. The presence of ODH was evaluated with slit lamp biomicroscopy at each clinic visit.

Results: Of 158 eyes (158 patients), 15 (9.4%) had ODH noted at least once during the 2-year study period. Seven eyes (4.4%) had ODH identified on postoperative day 1; 3 of these were also noted one month prior to surgery, and three did not persist at one month after surgery. Nine eyes (5.6%) had ODH identified during the year before phacoemulsification, and 10 eyes (6.3%) had ODH noted during the year after phacoemulsification. Eleven of 15 patients (73%) with ODH were using aspirin at the time the ODH was identified (p=0.015).

Conclusions: Our cross-sectional study found a prevalence of ODH immediately after phacoemulsification that was similar to other published rates, and we did not find an appreciable increase in ODH incidence in the year after phacoemulsification, compared to the year prior to surgery. These results imply that the supra-physiologic short term IOP fluctuation experienced during phacoemulsification does not commonly lead to ODH in glaucoma patients.

56. Posterior Vitreous Detachment Artifact on Retinal Nerve Fiber Layer Thickness Map

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Purpose: Posterior vitreous detachment (PVD) is a separation of the vitreous from underlying retina and is often seen on ophthalmologic exam. While existing studies have examined the effect of a partial PVD on retinal nerve fiber layer thickness (rNFL) as measured by optical coherence tomography (OCT), to our knowledge the finding of a PVD artifact on the rNFL thickness map has never been reported.

Methods: Small case series of 4 patients reporting the finding of a PVD artifact on rNFL thickness map obtained with the Zeiss Cirrus HD OCT machine. After presence of a shadow was identified on the map, a fundus photograph of the PVD was obtained in 3 patients.

Results: Four patients, 2 glaucoma suspects and 2 patients with primary open angle glaucoma (POAG) were included. Patient 1 is a 73-year old female glaucoma suspect due to the presence of increased optic nerve cupping. On her most recent dilated exam, she was noted to have a PVD in her right eye that corresponds with an artifact on her rNFL thickness map. Patient 2 is a 98-year old male who is also a glaucoma suspect and has a PVD in his right eye that is seen as an artifact shadow on his rNFL thickness map. Patient 3 is a 68-year old male with POAG on two topical agents. He has a very prominent PVD on exam and as a shadow on his thickness map. Patient 4 is a 64-year old female with POAG on a prostaglandin analog. She also has a PVD that is evident both on exam and as an artifact on imaging.

Discussion: In this case series, we report the unique finding of a PVD artifact on the rNFL thickness map in 4 patients with known or suspected glaucoma as seen in Figure 1.

Conclusion: Both PVD's and glaucoma have increased incidence with increased age. In the diagnosis and management of glaucoma, rNFL thicknes is currently one of the few tests in our armament. Previous studies have considered the contribution of a PVD or partial PVD to falsely increased thickness by adjacent vitreopapillary traction. However, to our knowledge this is the first report of the presence of a PVD artifact on the rNFL thickness map. The presence of this artifact should alert the practitioner to use caution in the interpretation of rNFL thickness in a patient with known or suspected glaucoma.

References

Batta P, Engel HM, Shrivastava A, Freeman K, et al. Effect of partial posterior vitreous detachment on retinal nerve fiber layer thickness as measured by optical coherence tomography. Arch Ophthlamol. 2010 Jun;128I6):692-7.

Cabrera S, Katz A, Margalit E. Vitreopapillary Traction: Cost-Effective Diagnosis by Optical Coherence

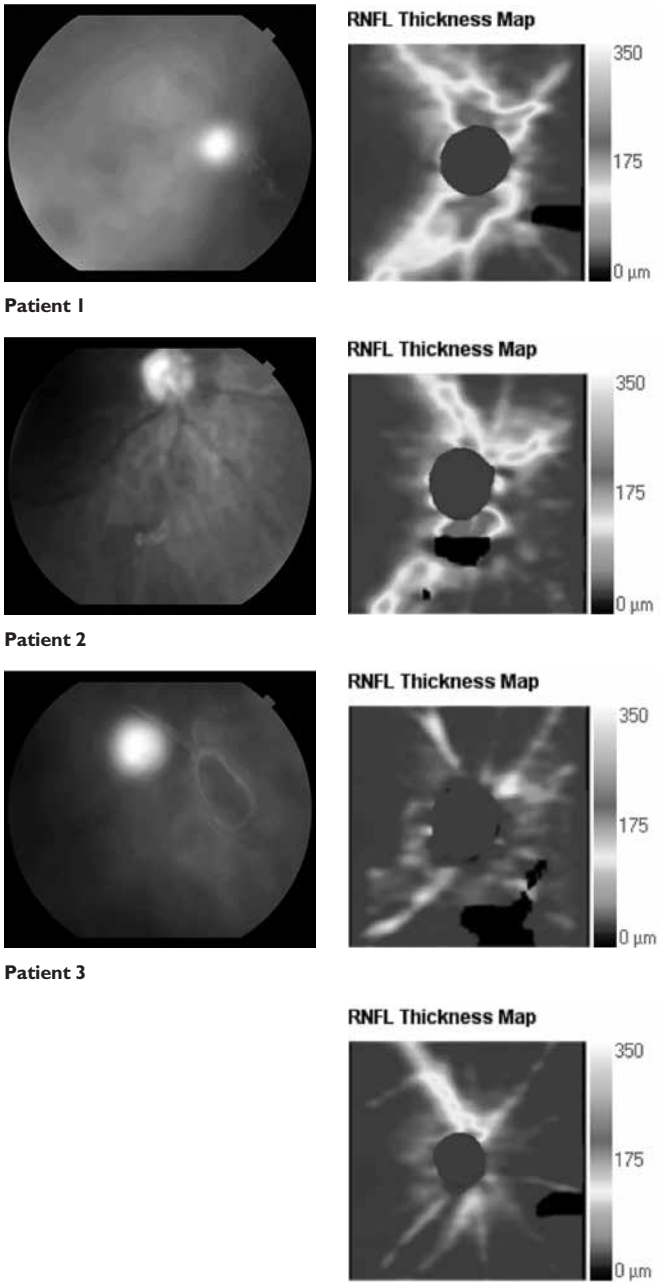

Figure 1. PVD photograph and corresponding artifact on rNFL thickness map by Zeiss Cirrus HD OCT

57. 3D Image Modeling of the Human Trabecular Meshwork

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Purpose: To develop a 3-dimensional (3D) model of the human trabecular meshwork (TM) exploiting 2-photon excitation fluorescence (TPEF) optical sectioning for deep tissue and cell imaging.

Methods: Viable post-transplant human donor corneoscleral tissue containing the TM was imaged by TPEF (Leica SP5), aided by multiple modalities: autofluorescence (AF), second harmonic generation (SHG), intravital dye live cell fluorescence, direct fluorescent dyes, viral transduction of fluorescent proteins, indirect immunofluorescence (eg., anti-type IV collagen, myocilin and alpha-smooth muscle actin (ASMA) primary antibodies), and 3D reconstruction (Imaris). Pharmacological probes were tested in the system: dexamethasone (Dex; steroid-induced glaucoma), TGF-beta1 (POAG pathogenesis) and an actin-altering agent being developed for glaucoma therapy (latrunculin-A (LAT-A)).

Results: About 70% of cells in the TM were alive in viable tissue. AF imaging revealed structural features of the uveal, corneoscleral and juxtacanalicular TM in great detail. Elastin and collagen were present within TM beams and could be distinguished in AF images without labeling. Basement membrane proteins such as type IV collagen surrounded trabecular beam cores. Intravital dyes revealed live cells and their associations within the 3D TM structure. Tissue exposure to Dex induced myocilin that localized in basement membranes. TGF-beta1 induced ASMA that localized intracellularly. F-actin had a cortical distribution in cells and wrapped around trabecular beams. LAT-A disrupted this pattern and quantitative image analysis showed reduced actin fluorescence (p=0.002).

Discussion: TM structure, cells and protein expression were simultaneously analyzed within the 3D architecture of the human TM. In this unique model, live cells, cellular interactions such as actin cytoskeleton dynamics, and drug effects were observed in situ without conventional tissue embedding and sectioning.

Conclusions: The model provides an accessible and novel platform for exploring TM biology, intraocular pressure regulation and drug discovery.

References

1. Tan JC, Gonzalez JM Jr, Hamm-Alvarez S, Song J. In situ autofluorescence visualization of human trabecular meshwork structure. Invest Ophthalmol Vis Sci. 2012;53:2080-8
2. Gonzalez JM Jr, Heur M, Tan JC. Two-photon immunofluorescence characterization of the trabecular meshwork in situ. Invest Ophthalmol Vis Sci. 2012;53:3395-404.

58. Novel Corneal Biomechanical Parameters in Glaucoma Eyes versus Normal Eyes

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Purpose: To identify novel corneal biomechanical parameters differentiating glaucomatous from normal eyes assessed by a novel methodology.

Methods: This prospective, cross-sectional comparative study of 102 subjects with varying degrees of glaucoma severity, and 66 normal controls, was conducted at Queen Mary Hospital in Hong Kong. The Corvis ST device (Oculus, Wetzlar, Germany), which couples a pneumotonometer with a high speed Scheimpflug camera, was utilized to measure IOP, CCT, and new biomechanical parameters including corneal deformation amplitude, inward and outward applanation length and velocity, as well as highest concavity time in both eyes of all subjects. Subjects with known corneal disease or any intraocular surgery within the three months preceding the study were excluded.

Results: Significant findings included differences in CCT (glaucoma: 536 ± 33 μm; normal: 556 ± 40. μm; P = 1.4 E-5), outward applanation velocity (glaucoma: -0.36 ± 0.10 m/s; normal: -0.33 ± 0.06 m/s; P = 5.9 E-4), and highest concavity time (glaucoma: 16.8 ± 0.6 s; normal: 17.0 ± 0.6 s; P = 2.8 E-3). There was moderate correlation between both IOP and CCT, and outward applanation velocity (R = 0.50 and 0.36, respectively), and no correlation between either IOP or CCT, and highest concavity time (R = 0.086, and 0.030, respectively). No correlation was found between age and either outward applanation velocity (R = 0.070) or highest concavity time (R = 0.0032). Average IOPs of glaucoma subjects and normal controls were 15.2 ± 3.4 mm Hg and 14.6 ± 2.0 mm Hg, respectively (P = 6.2 E -2).

Conclusions: Glaucomatous eyes had a greater mean outward applanation velocity and shorter time to highest concavity than controls. The difference in highest concavity time between glaucoma and normal eyes did not correlate with age, IOP, or CCT, suggesting that this parameter is a possible independent risk factor for glaucomatous disease.

59. Determinants of Visual Field Reliability

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Purpose: To determine the impact of visual field (VF) parameters on VF reliability.

Methods: Reliability was determined for individual visual fields by: (1) identifying eyes with at least 5 VF tests, (2) predicting the mean deviation (MD) for each VF based on the baseline (first field) MD, average MD over the study period, time from the baseline VF date, and the number of VFs performed in the year, (3) calculating a residual MD based on the difference between the predicted and observed MD, and (4) performing multivariable linear modeling of residual MD in decibels (dB) and multivariable logistic modeling of the likelihood of having a residual MD more than 2 standard deviations outside the norm for the studied eye. Residual MD was taken as a measure of VF reliability, and modeled predictors of residual MD included false negative percentage, false positive percentage, percentage of fixation losses, number of fixation trials, test duration, time of VF testing, day of VF testing, season of year, and patient age.

Results: Results were evaluated for a total of 1,778 eyes in 1,047 patients, and mean duration between the first and last VFs was 5.1 years. More false positives were associated with a greater observed MD than predicted (+1.1 dB/10% false positives, $p<0.001$) while more false negatives were associated with a lower observed MD than predicted (-0.4 dB/10% false negatives, $p<0.001$). Fixations losses were not independently associated with residual MD, while longer test duration was associated with a lower observed MD than predicted (-0.4 dB/extra minute of test duration). Other significant predictors of residual MD included season of year and day of week ($p<0.05$ for both). The only significant risk factors for a residual MD at least two standard deviations outside the norm for the studied eye were percentage of false positives, percentage of false negatives, and test duration ($p<0.001$ for all).

Discussion: False positives, false negatives and test duration are significant predictors of VF reliability, while fixation losses do not significantly predict VF reliability independent of other factors. The greatest impact on VF reliability was noted for false positives, with over 1 dB of predicted MD error noted with 10% false positives.

Conclusions: False positive percentage, false negative percentage, and test duration should be the primary clinical criteria for determining whether or not a VF result can be considered reliable.

60. Dynamic Intraocular Pressure Pattern Following Postural Change from Sitting to Supine in Healthy Subjects

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Purpose: To evaluate changes of the intraocular pressure (IOP) following the change of body position from sitting to supine using a contact lens sensor (CLS).

Methods: Following baseline enrollment examination, healthy subjects underwent a single 24-hour IOP pattern recording using Triggerfish® (TF; Sensimed AG, Lausanne, Switzerland) in an ambulatory setting. After about 22 hours of CLS wear, while still wearing the sensor, Goldmann applanation tonometry (GAT) was performed in the contralateral eye with the subject sitting (t_0), then in the lateral decubitus position after lying for 15 and 45 minutes (t_{15} and t_{45}), and finally after 30 minutes of sitting again (t_{75}).

Results: 18 Subjects were included in the analysis. Mean age was 33.1±12.9 years, and 52.4% were male. The mean duration of CLS wear was 23.6±0.8 h. Mean baseline GAT IOP was symmetric for both eyes, both in the sitting and supine position (13.7 and 17.8 mmHg, respectively). On the following day, mean positional change of GAT IOP was 5.2±2.5 mmHg ($p< 0.001$, t-test) at t_{15} and 3.6±1.9 mmHg ($p<0.001$) at t_{45}. While remaining in the supine position (t_{15}-t_{45}) the IOP significantly decreased by 1.63±1.49 mmHg ($p< 0.001$). The mean change of CLS output was 2.3±42.4 arbitrary units (AU) at t_{15} and 27.8± 48.6 AU at t_{45}. Time to IOP peak from t_0 as measured by the CLS was 63.3±27.5 min (range 15-105 min). There was no significant correlation between measurements with GAT and CLS at t_{15} (-0.21, p=0.41, Pearson) and at t_{45} (-0.22, p=0.39). There was no significant correlation (-0.15, p=0.63) for the change in IOP and CLS output between eyes in the supine position ($t_{15\text{-}45}$). Changing from recumbent to upright sitting ($t_{45\text{-}75}$) however, showed a significant negative correlation (-0.62, p=0.03) between change in GAT (-3.6±2.2 mmHg) and TF output (-38±43.4 AU).

Discussion: The IOP peak measured with the CLS output occurred later than that of the GAT measurement following postural change. This finding may be due to differences in measurement technique and effects of corneal-scleral biomechanical properties.

Conclusions: Following postural change the time to peak IOP was significantly longer when measured with the CLS than with GAT.

61. "Is the Retrobulbar Space an Effective Compartment for Drainage of Aqueous Humor?" Results from Animal and Human Studies

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Purpose: To report the efficacy of diverting aqueous humor from the anterior chamber to the retrobulbar space (RBS) using a new modified Ahmed Glaucoma Valves (AGV-RB) in rabbits and humans.

Methods: The AGV-RB consists of an anterior tube and a posterior tube with fenestrations joined in the middle by the Ahmed valve mechanism (minus the end plate). The anterior tube is inserted into the anterior chamber while the larger bore posterior tube with fenestrations is inserted into the retro bulbar space. The middle valve is sutured to the sclera at approximately 7 mm posterior to the limbus. The AGV-RB is inserted into 7 New Zealand Albino rabbits and followed for 6 months. The aqueous absorption by the orbital fat is studied by the injection India ink into the AC 1 day prior to euthanasia. AGV-RBs were also inserted into 12 patients with intractable glaucoma (10 posterior components as extensions from an existing encapsulated bleb and 2 as full AGV-RBs).

Results: In the rabbit model, the preoperation IOP was 14 mm Hg and 11 at 6 months. Histology revealed India ink scattered with in the retro orbital fat. The 12 patients with AGV-RBs were followed for an average of 12 months (SD 8). Preoperative IOP and medications were 32 mmHg (sem 3) and 2.5 (0.4), respectively, and at one year were 14.6 mm Hg (1.6) (P=0.0006) and 0.4 (0.2) (P=0.0015). No traditional bleb complications were noted in either humans or the animal model. 4 eyes of the retrobulbar extension implant patients required conservative clinical management measures including early postoperative intracameral viscoelastic at the slitlamp.

Discussion: Bleb encapsulation from excessive postoperative fibrosis is the leading cause of GDD failure. Our studies suggest that the IOP can be successfully controlled by diverting the aqueous humor into the retrobulbar space where orbital fat helps to absorb it and the hydrophobic milieu discourages fibrosis. In both the animal model and in humans no insurmountable complications were encountered, and there was an absence of hypertensive phase. Implantation of an AGV-RB in the subtenons space is straight forward perilimbal surgical procedure.

Conclusions: AGV RB successfully controlled the intraocular pressure by diverting the aqueous humor into retrobulbar area in the absence of traditional bleb

Reference

Hong CH, Arosemena A, Zurakowski D, Ayyala RS. Glaucoma drainage devices: a systematic literature review and current controversies. Surv Ophthalmol. 2005 Jan-Feb;50(1):48-60.

62. Contact Lens Sensor Is Well Tolerated During Continuous 24-hour Intraocular Pressure Pattern Recording

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Purpose: To determine tolerance to a silicone-based contact lens sensor (CLS) for continuous intraocular pressure (IOP) pattern recording for up to 24 hours.

Methods: In order to describe the level of comfort of CLS wear (Triggerfish®; Sensimed AG, Switzerland) during 24-hour IOP pattern recording, data has been pooled from five prospective, unmasked studies (USA and Europe). Subjects reported their tolerance to CLS wear on study specific tools for comfort assessment, converted to a mean percentage of comfort (0% is a lowest and 100% a highest level of comfort). In one study, patients were exposed to two 24-hour CLS wear sessions. All subjects were provided with artificial tears during CLS wear ad libitum.

Results: The tolerability dataset consists of 190 sessions of 24-hour CLS wear in 150 subjects with a mean duration of 23.9±0.04 hours. Sixty-nine subjects were from 2 studies in the USA and 81 from 3 European studies. Subjects were of predominantly Caucasian descent and were either healthy (38%) or patients (63%) with suspect and established open angle glaucoma with a mean age of 53.8±13.7 yrs. The mean age for pooled healthy subjects (44.8±12.4 yrs) and glaucoma suspects (52.9±17.1 yrs) was lower than that of patients with OAG (60.9±12.0 yrs).

The overall mean percentage of comfort across studies is 73.1% for a total of 190 24-hour CLS exposures ranging from 68% to 75.7%. The mean comfort level for healthy subjects (72.7%), glaucoma suspects (77.9%) and patients with open angle glaucoma (71.8%) was similar. No difference of comfort was observed for two consecutive 24-hour IOP recording 6-9 days apart in 40 patients.

Discussion: No IOP recordings were prematurely terminated due to adverse events during 24-hour CLS wear. A good subjective comfort level following CLS wear was reported for each of studies and it was similar for repeated exposure to the CLS and for different study populations.

Conclusions: The wear of the CLS is well tolerated during 24-hour IOP pattern recording.

63. A Correlative Evaluation of Active Outflow Area and Morphology between Primary Open Angle Glaucoma and Normal Eyes

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Introduction: Our previous studies demonstrated that active flow area have an inverse relationship with outflow resistance in non-human eyes (1-3). The goal of this study is to determine changes in outflow patterns and correlative morphology responsible for decreased outflow facility in primary open angle glaucoma eyes (POAG) compared to normal eyes.

Methods: Four POAG eyes and four normal human eyes were perfused for 30 minutes at 15mmHg to establish a stable baseline outflow facility. Anterior chamber of each eye was exchanged (5mL) and perfused with fixed volumes (200µL) of fluorescent tracers and perfusion-fixed. Tracer patterns in trabecular meshwork (TM) and episcleral veins (EV) of each eye were imaged globally with active outflow areas analyzed. Eyes were cut into quadrants and categorized into high, low, or no-flow areas. Tracer distribution in TM and EV was imaged by confocal microscopy. Correlative morphology by light and electron microscopy was evaluated.

Results: Baseline outflow facility was significantly lower in POAG eyes compared to normal eyes ($p<0.05$). Active outflow areas were segmental in normal eyes and was significantly reduced in POAG eyes ($p<0.05$). Interestingly, remaining active flow areas of POAG eyes were largely in the nasal quadrant. Although POAG high-flow areas showed similar tracer distribution in the TM as normal eyes, their EVs showed reduced amounts. Low-flow areas showed tracers solely in the TM for both groups and no-flow areas showed no fluorescent tracers in either the EVs or TM. No-flow areas of POAG eyes showed a completely collapsed Schlemm's canal (SC) and with collector channel (CC) ostia blocked by herniated TM. Also, there were more extracellular matrix protein deposits, increased thickness of basement membrane of the inner wall of SC and TM beams and less open spaces between TM beams. TM height and giant vacuoles of the inner wall of SC were significantly reduced in POAG eyes compared to normal eyes ($p<0.05$). Normal eyes showed open SC and CC regardless the type of flow.

Discussion: Compared to normal eyes, POAG eyes have identifiable morphological changes that correspond with a significant reduction in active outflow areas and decreased outflow facility.

Conclusions: This study provides new insights for understanding the pathogenesis of POAG and for novel therapeutic strategies to lower IOP in POAG by both locating and increasing active areas of outflow.

References

1. Battista SA, et al: Reduction of the available area for Aqueous humor outflow and increase in meshwork herniations into collector channels following acute IOP elevation in bovine eyes. Invest. Ophthalmol Vis Sci, 49:5346-5352, 2008.
2. Lu Z, et al: The mechanism of increasing outflow facility by rho-kinase inhibition with Y-27632 in bovine eyes. Exp Eye Res, 86: 271-281, 2008.
3. Lu Z, et al: Similar hydrodynamic and morphological changes in the aqueous humor outflow pathway after washout and Y27632 treatment in monkey eyes. Exp Eye Res, 93: 397-404, 2011

64. The Impact of Severe Glaucoma on Aqueous Humor Outflow Facility after Cataract Surgery

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Purpose: To assess the effect of cataract surgery on aqueous humor outflow facility and intraocular pressure (IOP) in patients with severe glaucoma.

Methods: 9 patients with visually significant cataract were included in the study including 4 eyes of 4 patients with severe glaucoma and 5 eyes of 5 patients with no other ophthalmic disease. Preoperative and postoperative (minimum 90 days) tonography and IOP measurements were taken on patients undergoing cataract surgery. Differences in outflow facility and IOP between the severe glaucoma group and the control group were analyzed using nonparametric Wilcoxon rank sum test.

Results: The IOP change observed in the severe glaucoma and control groups were 6.5+/-10.106 (glaucoma) and 5.2+/-2.964 (control) respectively (p=1.000). Both the severe glaucoma and control groups showed a significant decrease in IOP from pre-operative levels with an average decrease of 5.778±3.301 (p=0.0078). However, the severe glaucoma patients showed a marked decrease (0.06250+/-0.07277) in post-operative aqueous humor outflow facility whereas the control patients showed an increase (-0.05200+/-0.05784) in post-operative aqueous humor outflow facility (p=0.0200).

Discussion: Previous studies have suggested that perhaps cataract surgery (with subsequent IOP decrease) might be beneficial for our advanced glaucoma patients given a presumed increase in aqueous humor outflow facility. Our findings from this study do confirm an IOP decrease in the short-term; however, the aqueous humor outflow facility also decreases which could potentially lead to a future escalation of IOPs.

Conclusions: Based on this study, we suggest careful consideration of cataract surgery in patients with severe glaucoma. Although cataract surgery induces short-term reductions in intraocular pressure in both severe glaucoma and control patients, phacoemulsification may damage the trabecular meshwork and may ultimately increase IOP. Adjunctive treatment with selective laser trabeculoplasty (SLT) or i-stent that increases conventional outflow should be considered.

65. Continuous Intraocular Pressure Recording Using a Contact Lens Sensor Did Not Change Central Corneal Thickness

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Purpose: A study demonstrated a significant "mean change from baseline of the central corneal thickness" (mCCT; 14±4.6 µm, p=0.015) after 9 hours of overnight contact lens sensor (CLS) wear (Freiberg et al. 2012). There was no difference between study and contralateral eyes (p=0.075). This analysis of pooled data was aimed to determine the effect on mCCT after CLS wear for 24-hour continuous recording of the intraocular pressure (IOP) pattern.

Methods: To determine the effect of a silicone-based of CLS wear during 24-hour IOP recording, data has been pooled from five prospective, open label studies (2 in the USA and 3 in Europe). The CLS (SENSIMED Triggerfish®; Sensimed AG, Switzerland) has a high oxygen permeability coefficient of ≥ 125 Dk/t (Fatt units). The CCT was measured by ultrasound pachymetry immediately before and after CLS wear.

Results: The dataset consists of 191 sessions of 24-hour CLS wear in 151 subjects with a mean duration of 23.9±0.04 hours. Sixty-nine subjects (46%) were in the USA and 82 (54%) in Europe. Subjects of predominantly Caucasian descent were either healthy (38%) or patients (62%) with suspected or established open angle glaucoma with a mean age of 53.8±13.7 years. Healthy subjects (44.8±12.4 years) were significantly younger than patients with suspected and established OAG (59.1±13.1 years; p<0.001 (t-test)).

The overall mCCT across studies was -0.1±3.0 µm, for a total of 191 24-hour CLS exposures. The mCCT was not statistically significantly different in any of the studies and ranged from -12.3 to 4.1 µm (-2.2% to 0.7%). The mCCT in healthy subjects (-5.6±2.4) was statistically significantly lower than in patients with suspected or established open angle glaucoma (0.2±3.3; p<0.001). The first 24-hour CLS wear showed a statistically significantly higher increase of mCCT (4.1±2.7) than the second session 6-9 days later (0.7±0.4; p<0.001).

Discussion: Overnight CLS wear did demonstrate a significant increase of the mCCT. In contrast, pooled data from 5 studies demonstrated that the mCCT did not change from baseline after 24-hour IOP recording using the CLS.

Conclusions: The central corneal thickness did not change following use of a CLS for the recording of the 24-hour IOP pattern.

66. The Role of Central Corneal Thickness in Risk Stratification for Pigmentary Glaucoma

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Purpose: The Ocular Hypertension Treatment Study (OHTS) was the first to define central corneal thickness (CCT) as an independent risk factor for the development of primary open angle glaucoma (POAG). Little is known about the relationship between CCT and other forms of open angle glaucoma. This retrospective study was designed to evaluate this relationship between CCT and both pigment dispersion syndrome (PDS) and pigmentary glaucoma (PG).

Methods: Retrospective case control study (2005-2012) involving 300 control eyes with POAG compared with 141 consecutive eyes diagnosed with either PDS or PG. The diagnosis of PDS was based on slit lamp evaluation that revealed iris transillumination defects, Krukenberg spindles or diagnostic gonioscopy. PG was defined by the presence of PDS with visual field and optic nerve head changes consistent with glaucoma. Intraocular pressure (IOP) was obtained by applanation tonometry and CCT was obtained by ultrasonic pachymetry readings. The Levene's test demonstrated equality of variance between the controls and patients with PDS/PG. The independent sample t-test was then used to compare the mean IOP and mean CCT between the 2 groups.

Results: Overall, PDS/PG patients demonstrated a significantly thicker mean CCT than POAG controls (555.87 $\pm$ 38.75 vs. 541.32 $\pm$ 42.77 µm, p=0.001) and PDS/PG was associated with higher average IOP (15.14 $\pm$ 4.15 vs. 13.15 $\pm$ 3.67 mm Hg, p=0.000). When gender was accounted for, male patients with PDS/PG continued to demonstrate this trend (CCT 555.71 $\pm$ 40.81 vs. 539.71 $\pm$ 41.71 µm, p=0.009 and IOP 15.37 $\pm$ 4.82 vs. 12.78 $\pm$ 3.81 mm Hg, p=0.000). This relationship was also true for women (CCT 556.03 $\pm$ 36.96 vs. 542.73 $\pm$ 43.75 µm, p=0.026 and IOP 14.92 $\pm$ 3.40 vs. 13.47 $\pm$ 3.51 mm Hg, p=0.004). There was no statistical difference between patients with PDS and PG (CCT 561.29 $\pm$ 34.14 vs. 549.90 $\pm$ 40.85 µm, p=0.09 and IOP 15.57 $\pm$ 3.88 vs. 14.57 $\pm$ 3.52 mm Hg, p=0.118).

Discussion: Pigment dispersion is associated with young, myopic patients who tend to have greater fluctuations in IOP. By identifying risk factors, we can develop better screening tools and risk assessments for progression of disease. This study suggests that patients with PDS or PG tend to have a higher IOP and thicker central corneal thickness at initial presentation compared to POAG controls. While OHTS identified greater CCT as a negative risk factor for the onset of POAG, there was no significant difference in CCT of patients with PDS compared to those with PG. Due to the retrospective nature of this study, it is unclear if the greater CCT is directly associated with PDS/PG or if it is an integral part of the pathology in these conditions.

Conclusions: Patients with PDS or PG had greater CCT and higher IOP compared to POAG controls at initial presentation. There was a trend for greater CCT in PDS compared to PG however the difference did not reach statistical significance.

67. A Prospective Trial Evaluating Scleral Rebound Tonometry

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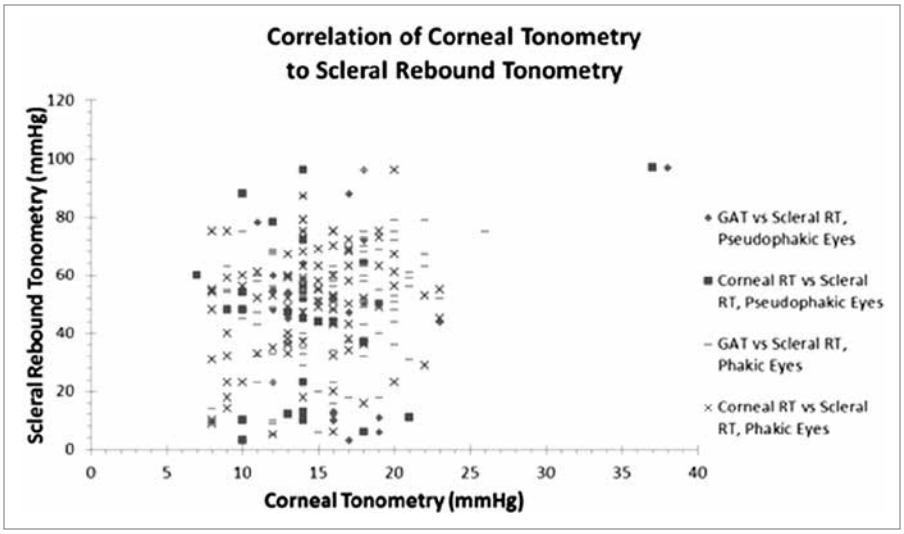
Purpose: Glaucoma is known to occur in about 75% of patients following a keratoprosthesis, but accurate pressure readings to monitor for progression are not possible. Thus we sought to determine if a predictable relationship exists between Goldmann applanation tonometry (GAT) and scleral rebound tonometry (RT) to provide an accurate and reliable assessment of intraocular pressure (IOP) via scleral measurements.

Methods: A prospective non-randomized trial of individuals 18 years of age and older. Each had his/her IOP measured by GAT, next corneal RT then scleral RT on the inferotemporal sclera. The patient's age, gender, refractive error, central corneal thickness (CCT), axial length (AL) and phakic status were recorded. Pearson's correlation was used for statistical analysis.

Results: 116 eyes from 59 patients (37-90 years old) have been examined to date. Mean GAT IOP was 15.91 mmHg (SD 4.13), mean corneal RT was 14.50 mmHg (SD 4.24) and mean scleral RT was 48.84 (SD 21.41). Mean spherical equivalent refraction (SE) was -0.21 D (SD 2.05), mean CCT was 547.68 µm (SD 45.65), mean AL was 24.06 mm (SD 1.21). 90 eyes were phakic and 26 were pseudophakic. Pearson analysis reveals a strong positive correlation between GAT and corneal RT (0.77) but weak positive correlation between GAT and scleral RT (0.22) as well as corneal RT and scleral RT (0.22). This trend persists when phakic and pseudophakic eyes are evaluated independently. Figure 1 is a correlation plot of corneal versus scleral tonometry.

Discussion: Scleral RT shows IOP measurements that are consistently higher than corneal IOP measurements by roughly 33-34 mmHg. Corneal RT correlates well to the gold standard of IOP measurement, GAT; unfortunately, scleral RT measurements have poor correlation to corneal measurements independent of phakic status.

Conclusions: Our study reveals that sceral RT does not provide accurate and reliable IOP measurements as compared to GAT and corneal RT even when adjusting for phakic status. With further data collection and analysis we hope to determine an equation which would provide the true IOP as a function of scleral RT measurements by taking SE, AL, CCT and phakic status into consideration.



68. The Jigsaw Effect: Clinical Evidence for CNS Control of Chronic Glaucomatous Neurodegeneration

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Purpose: To statistically assess the tendency for the conservation of the binocular visual field in patients with moderate to severe glaucomatous visual field loss in both eyes.

Methods: Case control study. Subjects: Forty seven patients with stabilized chronic progressive glaucoma demonstrating bilateral reliability in Humphrey Visual Field 30-2 testing, and control of intraocular pressure were evaluated. One pair of visual fields was assessed for each individual. Each visual field locus of the right eye was paired with the comitant point in the visual field of the fellow left eye. Mean threshold values and their distributions were calculated for the 76 loci of each eye, and the mean value for the higher value of each of the 76 paired individual comitant locus values from the two eyes were similarly calculated for all subjects. This same process was repeated after randomizing the sequence of threshold values for the right eye only, producing arbitrary pairing with the fellow eye. Additional analyses were performed to assess the impact of anatomic symmetry on patterns of visual field loss by comparing the mirror-image loci of the paired fields

Results: A very strong tendency for conservation of the bilateral visual field in a manner that defies simple anatomic symmetry considerations was observed ($P<0.0001$)

Conclusions: It is known that focal axonal injury that results in decrease in function in one eye may be accompanied by increased activity in the lateral geniculate layer receiving comitant visual information from the fellow uninjured eye. It appears that focal compensation of this kind might be involved in the conservation of the bilateral visual field in patients with chronic progressive glaucoma.

69. Effect of Ancestry, as Based on Racial Identification, on Optic Nerve Head Parameters

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Purpose: Research has established racial differences in optic nerve morphology between patients of African and European descent. SD-OCT scanning has demonstrated these differences with respect to optic disc area, average cup-disc ratio, cup volume, and nerve fiber layer.[1] However, the term "African descent" describes a heterogeneous group with considerable variability. For example, studies on cardiovascular disease mortality found that Caribbean-born blacks had mortality rates substantially lower than their African-American counterparts.[2] As such, there is concern that grouping together such diverse patients minimizes the effect of race on differences in the optic nerve and nerve fiber layer. In this study, we assess the hypothesis that there are racial differences in optic disc area, rim area, cup volume, average cup-disc ratio, vertical cup-disc ratio, and RNFL thickness as measured by Cirrus HD-OCT between Afro-Caribbean and Afro-American patients.

Methods: 25 Afro-American subjects and 25 Afro-Caribbean subjects were consecutively recruited to this study. Race was based on self-description. Only patients with normal ophthalmic examinations were included. All patients received imaging of the optic nerve and nerve fiber layer with Cirrus HD-OCT Optic Disc Cube 200x200 protocol. Disc area, rim area, cup volume, average cup-disc ratio, vertical cup-disc ratio, and RNFL thickness were included. The main outcome measures were associations between Cirrus HD-OCT optic nerve head and RNFL measurements and race. Sample size calculations were based on demonstrated racial differences in RNFL thickness and optic nerve head parameters.[3]

Results: Differences in optic nerve parameters and retinal nerve fiber thickness were measured by the two-sample t test. No significant difference was found in any of the optic nerve or retinal nerve fiber parameters, despite adequate power with regard to sample size.

Discussion: Findings of this study suggest that there are no significant differences by OCT between Afro-Americans and Afro-Caribbeans with respect to retinal nerve fiber layer thickness and optic nerve head parameters.

Conclusions: It follows that in our daily ophthalmology practice, it is appropriate to group Afro-Caribbeans and Afro-Americans in our diagnostic approach and treatment plans.

References

1. Girkin CA, Liebmann J, Fingeret M, Greenfield DS, Medeiros F. The effects of race, optic disc area, age, and disease severity on the diagnostic performance of spectral-domain optical coherence tomography. *Invest Ophthalmol Vis Sci.* Aug 2011;52(9):6148-6153.
2. Fang J, Madhavan S, Alderman MH. The association between birthplace and mortality from cardiovascular causes among black and white residents of New York City. *N Engl J Med.* Nov 21 1996;335(21):1545-1551.
3. Knight OJ, Girkin CA, Budenz DL, Durbin MK, Feuer WJ. Effect of race, age, and axial length on optic nerve head parameters and retinal nerve fiber layer thickness measured by Cirrus HD-OCT. *Arch Ophthalmol.* Mar 2012;130(3):312-318.

70. Scleral Pressure Measurement Pre- and Post-Keratoprosthesis Implantation in Cadaver Eyes

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Purpose: To correlate scleral pressure to IOP using pneumotonometry in cadaver eyes before and after Boston type I keratoprosthesis (KPro).

Methods: Central corneal IOP and scleral IOP at four quadrants were measured using pneumotonometry in 6 cadaver eyes cannulated with an infusion line with IOP held at 20, 30, 40, and 50 mmHg. Measurements were repeated after the KPro was implanted.

Results: Scleral IOP is higher than central corneal IOP by a mean of 13mmHg (range 10 to 16mmHg). Scleral IOP has a positive and linear correlation with central corneal IOP before KPro ($P < .00001$), and this correlation is highly preserved after KPro implantation ($P < .00001$).

Discussion/Conclusions: Scleral IOP by pneumotonometry may be used to estimate IOP in cadaver eyes with and without keratoprosthesis.

71. Correlation of Serum Calcium Levels to Primary Open Angle Glaucoma

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Purpose: To analyze serum calcium levels in patients with primary open angle glaucoma (POAG) versus those without.

Method: A retrospective chart review was done in order to determine the correlation between serum calcium levels and POAG in patients seen at Cook County Stroger Hospital, Chicago IL. Consecutive patient charts were reviewed retrospectively until at least 100 patients in each group were identified. Exclusion criteria were age younger than 50 years, no serum calcium level obtained within the last year, or diagnosis of other types of glaucoma or ocular hypertension. Patients that met these criteria were categorized as either control or POAG. The mean ages and serum calcium levels were determined for each group.

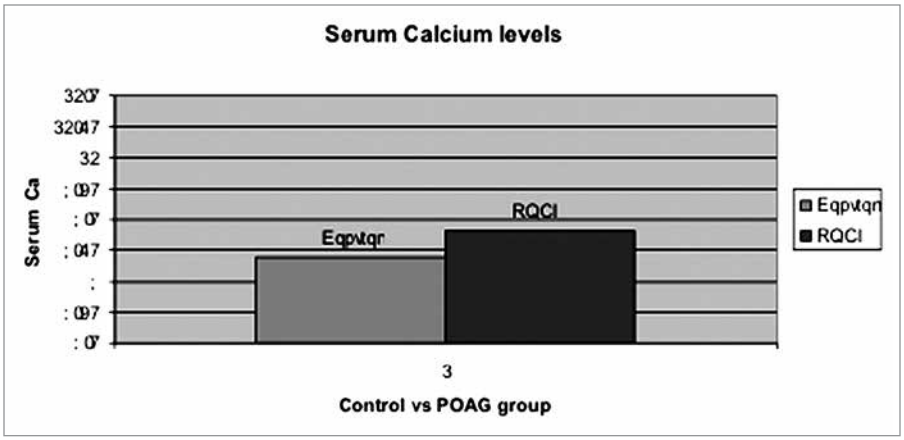
Results: The mean age of the control group (n=101) was 63.6 years with a mean serum calcium of 9.2 mg/dL (normal 8.5-10.5 mg/dL) and a range from 8.0-10.2 mg/dL. The mean age in the POAG group (n=104) was 66.2 years with a mean serum calcium level of 9.4 mg/dL and a range from 8.5-10.8 mg/dL. Therefore the difference was a mean calcium level of 0.2 mg/dL higher in the POAG group. An unpaired two-tailed T test was used to calculate the p value, which was statistically significant at $p<0.0147$.

Discussion: Previous studies looking at the association between the prevalence of glaucoma and the supplementation with oxidants, such as calcium, found that patients with supplemental oxidant use above a threshold level had an increased risk of glaucoma. Therefore, our study aimed to determine if there is a difference in the serum levels of calcium in patients with glaucoma as compared to those without. This study did find a statistically significant difference in the serum calcium levels of the two groups. The patients with POAG have a higher serum calcium value which may be consistent with the results of the previous study suggesting that supplementation above a certain level increases the risk of glaucoma.

Conclusions: Our studies show that there is a statistically significant increased mean serum calcium level in patients with POAG as compared to the control group. While this data does not suggest increased serum calcium levels as an etiology for POAG, it should be studied further to explore the correlation and causation. If such a connection is found, it could be monumental in treatment as well as screening and altering modifiable factors to reduce the risk of glaucoma.

Reference

Wang SY, Singh K, Lin SC. The association between glaucoma prevalence and supplementation with the oxidants calcium and iron. Invest Ophthalmol Vis Sci. 2012;53(2):725-731



72. Association of Aqueous Humor Dynamic Markers in Glaucoma with Canaloplasty Surgery

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Purpose: This retrospective case series was designed to examine potential markers that may be predictive of canaloplasty outcomes. We hypothesize that these markers include: fluorescein diffusion into the anterior chamber, blood reflux in the anterior chamber, and fluorescein diffusion into the episcleral venous system.

Methods: This study is a retrospective case series of 16 consecutive patients, who underwent canaloplasty surgery by a single surgeon. These patients were enrolled in an IRBMED approved protocol to review medical records for clinical research. During canaloplasty, the surgeon incorporated fluorescein canalography to evaluate these potential markers. Using high definition video recorded from these cases, the following dynamic data were extracted: fluorescein diffusion into the anterior chamber, blood reflux in the anterior chamber, and fluorescein diffusion into the episcleral venous system. These dynamic results will be correlated with the short-term canaloplasty outcomes.

Results: There were 4 females, and 12 males, with a mean age and SD of 60 +/-19 years. The pre-operative mean, maximum IOP within three clinic visits prior to surgery was 21 +/- 8.6 mmHg (range 12 - 45 mmHg). The glaucoma diagnoses included: juvenile glaucoma and open-angle forms of glaucoma. The final post-op IOP was 11 +/- 3.4 mmHg (range 2 - 15.5 mmHg).

Discussion: The dynamic markers will be correlated with the short-term canaloplasty outcomes.

Conclusions: The markers of fluorescein diffusion into the anterior chamber, blood reflux in the anterior chamber, and fluorescein diffusion into the episcleral venous system may be helpful in assessing surgical outcome of canaloplasty.
References: Grieshaber et al., IOVS 51:498-504, 2010

73. The Initial Clinical Features of Primary Open Angle Glaucoma

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Purpose: Primary Open Angle Glaucoma (POAG) is a vision threatening disease due to its symptomless nature and irreversible effects. There are no specific initial symptoms; thus, no clues to prompt early referrals to ophthalmologists. The purpose of this study is to retrospectively see how POAG patients present, relate their demographic factors to the diagnosis, and find a respective prognostic course of their disease.

Methods: From a compiled registry with patients initially diagnosed with POAG, we retrospectively reviewed the first and last visit of each patient, identified the chief complaint, grouped them in terms of race, gender, and family history, and recorded the cup to disc ratio, intraocular pressures (IOP), and visual acuity. Patients were also called by telephone to better characterize their initial symptoms.

Results: Patients were grouped as Black Males, Black Females, White Males, and White Females. Independent T Test testing was used. Blurry vision was the most common symptom with no symptoms being second. "Other" which included a myriad of complaints with no dominant feature was third. Likewise, at least 55% of patients in all groups had a family history of POAG with white females averaging 63%. When comparing IOP at the initial and final visit, black males did not reach statistical significance in either eye for adequate reduction (P value OD 0.09 & OS 0.064). Comparison of cup to disc ratio showed black females had a significant enlargement of their cup (P value OD 0.003 & OS 0.0007).

Discussion: Blurry vision was the most common presenting symptom, usually related to cataracts or dry eye. At least 55% of patients in all groups had a family history of glaucoma. Furthermore, over time, black males did not have their IOP adequately reduced and black females did not have stabilization of their cup to disc ratio.

Conclusions: POAG is an asymptomatic disease and patients usually present late for treatment. There are no symptoms to clue to an early diagnosis; however, a family history of glaucoma should prompt early referrals to ophthalmologists. Likewise, black patients need more aggressive treatment. Overall, this study identifies better ways for early referral and creates a patient specific treatment plan given respective risk factors and objective exam findings.

References

1. Grant, W. Morton et al. "Why Do Some People Go Blind from Glaucoma?"Ophthalmology. 1982; 89: 991-998.
2. Chelerkar, Vidya et al. "Clinical Presentation of Glaucoma: The Social Perspective." AIOC 2008 Proceedings.

74. Characterization of Prostaglandin F2α Receptors in Hair Follicles of Eyelids

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Purpose: To study the presence and distribution of prostaglandin $F_{2\alpha}$ (PF) receptors in hair follicles of eyelids throughout the hair follicle cycle by immuno-histochemical methods, and to suggest a possible explanation for the clinical observation of elongation, thickening and crowding of eyelashes following topical use of prostaglandin analogs.

Methods: Specimens from patients undergoing resection of upper or lower eyelids were routinely processed for histologic preparations. Following the histopathological examination, the sections were evaluated for presence of hair follicles and 15 specimens were found suitable for inclusion in the study.

Immunohistochemistry: The staining was carried out on Ventana Benchmark Automatic stainer, using polyclonal antibody directed against prostaglandin $F_{2\alpha}$ receptor, diluted to 1:1000 (Cayman Chemical, USA, Catalog No. 101802).

Evaluation of staining: Using a semi-quantitative 4-class scale (0-3), the intensity of staining in hair follicles and other epithelial elements in the specimens was assessed by 2 observers.

Results: Mean age of the 15 subjects was 77±14 and male/female ratio 2/1. The specimens were equally distributed between upper and lower lids. Matriceal cells were strongly stained (+3) and invariably present in bulbs and stems of hair follicles in the anagen phase. Inner root sheath of hair bulbs of anagen hair follicles were stained to a lesser extent. The staining was cytoplasmic, with membranous enhancement. Weak to no cytoplasmic staining (0-1) was seen in all epithelial cell, upper parts of hair follicles, catagen/telogen follicles, epidermis, conjunctival epithelium, sebaceous and sweat glands.

Conclusions: Elongation, thickening and crowding of eyelashes are commonly seen after topical use of prostaglandin analog eye drops. The observation that PF receptors are strongly expressed in the bulbs and stems of hair follicles during anagen phase provides a possible mechanism of action.

Poster Abstracts
Saturday, March 2, 2013

Glaucoma Management and Therapy

75. Selective Laser Trabeculoplasty Success in Pediatric Glaucoma Patients

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Introduction: Selective laser trabeculoplasty (SLT) is successful in adults, both as primay and secondary treatment for glaucoma.[1,2] Laser trabeculoplasty (Argon) has not been shown to be successful in aphakic or congenital glaucoma.[3] The purpose of this study is to describe success SLT in pediatric patients with congenital glaucoma.

Methods: Retrospective study of 2 patients with congenital glaucoma.

Results: Two patients with congenital glaucoma underwent SLT. One patient had secondary aphakic glaucoma and was taking 4 glaucoma medications. She had a 50% decrease in intraocular pressure (IOP) after 5 weeks after SLT. She was able to discontinue all 4 glaucoma drops after treatment. The second patient had early juvenile open-angle glaucoma and was on no medications. He had a 39% drop in IOP 4 weeks after SLT.

Discussion: This is the first reported case series of SLT success in pediatric glaucoma patients (one with secondary aphakic glaucoma and one with juvenile open-angle glaucoma). Both patients had significant reductions in IOP after SLT (50% and 39%, respectively). The first patient was able to discontinue all 4 topical medications. The second patient did not need to use topical glaucoma medication.

Conclusions: SLT can safely decrease IOP in pediatric glaucoma patients, both as primary and secondary therapy.

References

1. Lai JS, Chua JK, Tham CC, et al. Five-year follow up of selective laser trabeculoplasty in Chinese eyes. *Clin Experiment Ophthalmol.* 2004; 32:368-372.
2. McIlraith I, Strasfeld M, Colev G, et al. Selective laser trabeculoplasty as initial and adjunctive treatment for open angle glaucoma. *J Glaucoma.* 2006; 15:124-130.
3. Schwartz AL, Wilson MC, Schwartz LW. Efficacy of argon laser trabeculoplasty in aphakic and pseudophakic eyes. Ophthalmic Surg Lasers. 1997; 28: 215-218.

76. Argon Laser Trabeculoplasty (alt) by Residents: Predictors of Failure

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Purpose: ALT is widely used to control intraocular pressure (IOP) in glaucoma. We wished to determine predictive factors for long term success of ALT performed by supervised residents in training on patients at a local VA Hospital in Dallas.

Methods: Charts of patients with primary open angle glaucoma who underwent ALT between 2001 and 2011 were reviewed retrospectively. Those with follow up < 3 months, prior ALT/SLT, filtering procedure or inadequate data were excluded. The dependent variable was time to failure after ALT. Failure was defined as any additional medication, ALT/SLT or glaucoma filtering surgery. All patients were treated with 360 ° ALT. Logistic regression and receiver operating characteristic (ROC) analysis was performed to assess correlation between time to failure after ALT and age, pre-op IOP, C/D ratio, visual field defect, family history, refractive error, hypertension, diabetes, number of medications, laser energy used, central corneal thickness.

Results: Evaluable data was obtained on 206 patients; mean age 65, 98% male, and 61% black. 40.8% (84/206) were classified as ALT failures. Failure and non-failure patients had equal follow-up duration of median 2 yr. Pre-ALT LogMar (mean (SD) 0.25 (.3) vs. 0.35 (.3)), no. of glaucoma medications (2.9 (1.0) vs. 3.3 (1.0)), and myopia (46% vs. 61%) differed, respectively, between ALT failures and non-failures ($p<0.05$). In multivariable logistic regression models, after adjusting for age, hypertension, and diabetes, we found that myopia was protective (odds ratio (OR) =0.39, 95% CI 0.21-0.78, $p=0.005$) but that higher laser energy ((OR=1.6 for a 20k increase in energy, 95% CI: 1.1-2.4, $p=0.005$) was associated with increased risk associated for ALT failure; model ROC AUC = 0.70 (95% CI: 0.63-0.78).

Discussion: Our VA patients were mainly males but had good ethnical diversity. After 2 years, the failure rate of 40% was high indicating interplay of factors such as treatment by residents, noncompliance and sicker population. Better response in myopia may be related to thickness of trabecular meshwork while poorer response to increased laser energy may be from thermal damage. Patients using more than three meds were on systemic carbonic anhydrase inhibitors.

Conclusions: Long term results after ALT performed by residents on US veterans remain guarded. Patients who were myopic, or required less energy and were on maximal meds fared better.

References

Juzych MS, Chopra V, Banitt MR, Hughes BA, Kim C, Goulas MT, et al. Comparison of long-term outcomes of selective laser trabeculoplasty versus argon laser trabeculoplasty in open-angle glaucoma. *Ophthalmology*. Oct 2004; 111(10):1853-9

77. Resident-Performed Selective Laser Trabeculoplasty in Open Angle Glaucoma Patients

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Purpose: To evaluate the efficacy and safety of selective laser trabeculoplasty (SLT) performed by resident ophthalmologists.

Design: Retrospective case series

Methods: Records of consecutive patients treated with SLT by resident ophthalmologists at the San Francisco Veterans Administration Hospital over a two-year period were reviewed. Data including age, indication for treatment, laser settings, pre and postoperative intraocular pressures (IOP), number of eye drop medications, and complications were recorded. Analysis accounted for non-independence of measurements made on eyes in the same patient; change scores were assessed using a clustered Wilcoxon test (Rosner 2006).

Results: A total of 83 patients underwent 112 SLT operations from November 2009 to December 2011. Average IOP at referral was 19.1. IOP decreased to 18.0 on the day of SLT (p-value 0.036, clustered Wilcoxon signed rank). Mean decrease in postoperative IOP compared to referral was 4.1 (21%) at 3 months and 4.2 (22%) at 24 months. Increased treatment, defined by number of laser shots, was not associated with better IOP control, but was associated with reduced drop requirements The ($p = 0.002$, linear regression). There was no significant difference in IOP reduction at 6 months among residents ($p = 0.09$, linear mixed effects regression). There was no significant change in visual acuity after treatment ($P=0.54$, clustered Wilcoxon), or with increasing treatment ($P=0.85$, linear mixed effects regression). In a multivariate analysis, referral IOP was the greatest predictor of efficacy, defined as a decrease of IOP > 20%.

Discussion: IOP reduction in resident-performed SLT was in the 20-30% IOP reduction range reported for attending-performed SLT. The procedure was not found to significantly affect visual acuity.

Conclusions: We find no evidence that resident performed SLT varies in efficacy or safety among residents or differs from SLT performed by attending physicians. Increasing treatment may lead to less need for topical drops without significant side effects. Patients with higher pre-treatment IOP were most likely to receive benefit from the procedure.

References

Rosner B, Glynn RJ, Lee ML. The wilcoxon signed rank test for paired comparisons of clustered data. *Biometrics*. 2006; 62(1):185-192.

Samples JR, Singh K, Lin SC, Francis BA, Hodapp E, Jampel HD. Smith SD. Laser Trabeculoplasty for Open-Angle Glaucoma. A report by the American Academy of Ophthalmology. Ophthalmology Vol 118, No 11, Nov 2011.

78. Selective Laser Trabeculoplasty (slt): Predictors of Failure

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Purpose: SLT is widely used to control intraocular pressure (IOP) in glaucoma. We wished to determine predictive factors for long term success of SLT performed by full time faculty at a University Eye Clinic in Dallas.

Methods: Charts of patients with primary open angle glaucoma who underwent SLT between 2001 and 2011 were reviewed retrospectively. Those with follow up < 3 months, prior ALT/SLT, filtering procedure or inadequate data were excluded. The dependent variable was time to failure after ALT. Failure was defined as any additional medication, ALT/SLT or glaucoma filtering surgery. All patients were treated with 360° SLT. Logistic regression and receiver operating characteristic (ROC) analysis was performed to assess correlation between time to failure after ALT and age, pre-op IOP, C/D ratio, visual field defect (VFD), family history of glaucoma, refractive error, hypertension, diabetes, number of medications, laser energy used, central corneal thickness.

Results: Evaluable data was obtained on 189 patients; mean age 64, 44% male, 56% female, 49% white, 32% black, 12% Hispanic and 7 % others. 29.6% (56/189) were classified as SLT failures. Failure and non-failure patients had equal follow-up duration of median 2 yr. In multivariable logistic regression models, statistically significant risk factors associated with SLT failure were family history of glaucoma (odds ratio (OR) = 1.7, 95% CI: 1.1-2.7, p=0.02), higher pre-op IOP (OR =1.1, 95%CI: 1.0-1.15, p=0.03), and moderate to severe VFD (OR =2.6, 95% CI: 1.3-5.2, p=0.006); ROC AUC = 0.71 (95% CI : 0.62-0.80).

Discussion: Our patient population was well balanced based on gender and race. Long term results from SLT are guarded as nearly 1/3 patients failed at 2 years. Age and laser energy were not significant predictors of SLT while family history, advanced damage and higher IOP had negative effect on post-op IOP.

Conclusions: Over the long run, SLT results were better in patients with no family history of glaucoma or who had lower pre-op IOP and only mild to moderate visual field defects. Clinicians may want to use SLT earlier when the pressures are lower and damage mild to moderate.

Reference

Damji KF, Bovell AM, Hodge WG, Rock W, Shah K, Buhrmann R, et al. Selective laser trabeculoplasty versus argon laser trabeculoplasty: results from a 1-year randomized clinical trial. *Br J Ophthalmol*. Dec 2006; 90(12):1490-4.

79. Post-Procedure Intraocular Pressure of Titanium-Sapphire Laser Compared to Standard Selective Trabeculoplasty

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Purpose: To compare the efficacy of lowering intraocular pressure (IOP) using selective laser trabeculoplasty (SLT) versus titanium-sapphire laser trabeculoplasty (TLT). This project aims to evaluate the safety of this new laser in terms of 1 hour post-procedure IOP spikes as well as IOP reduction as compared to SLT. Only one previous study has been reported using TLT in human subjects, which found a 32% reduction in IOP following TLT versus a 25% reduction with ALT, though this difference was not statistically significant.[1]

Methods: 37 patients with glaucoma scheduled for trabeculoplasty were prospectively randomized to receive either SLT or TLT using a random number generator.

Results: The mean reduction in IOP at 2 months was 6.2 ± 4 mmHg (27% decrease from baseline) following SLT and 3.4 ± 3 mmHg (16% decrease from baseline) following TLT (p=0.22). There were 3 IOP spikes that were greater than 5 mm Hg at 1 hour post-procedure in the SLT group (15%) and there was 1 spike in the TLT group (6%). This difference was not statistically different (p=0.33).

Discussion: In comparing SLT to TLT, there were no statistically significant differences in incidence of 1 hour post-procedure IOP elevations or 2 month IOP reduction.

Conclusions: A novel titanium-sapphire laser may offer an equally efficacious alternative to standard laser trabeculoplasty in the treatment of glaucoma.

Reference

1. Goldenfeld M, Melamed S, Simon G, Ben Simon GJ. *Titanium:sapphire laser trabeculoplasty versus argon laser trabeculoplasty in patients with open-angle glaucoma.* Ophthalmic Surg Lasers Imaging. 2009 May-Jun;40(3):264-9.

80. The Relation between Iron Supplement Use and Risk of Primary Open-angle Glaucoma: Results from Two Prospective Cohorts

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Purpose: A recent study (1) observed adverse associations between iron supplement use and risk of primary open-angle glaucoma (POAG). We prospectively examined the association between dietary heme iron, dietary non-heme iron intake and iron supplement use in relation to the risk of POAG.

Methods: We followed 79,154 women from the Nurses' Health Study (NHS) and 45,206 men from the Health Professionals Follow-up Study (HPFS) who were at least 40 years of age, did not have glaucoma, and reported undergoing eye examinations from 1980 NHS / 1986 HPFS to 2008. Information on consumption of dietary and supplemental iron and various confounders was repeatedly ascertained in validated follow-up / food-frequency questionnaires. Cases of incident POAG (with reproducible visual field loss consistent with POAG) were confirmed with review of supplementary questionnaire and medical record information. Multivariate rate ratios (RRs) for POAG were calculated in each cohort and then pooled using meta-analytic techniques.

Results: During 22+ years of follow-up, a total of 1382 cases of incident POAG were identified. In multivariable analyses, dietary non-heme iron or dietary heme-iron was not associated risk of glaucoma (p-trend across quintiles of intake were 0.93 and 0.62, respectively). However, higher iron intake from supplements (multivitamins and specific iron supplements) was modestly adversely associated: compared with the lowest quintile of supplementary iron intake, those in the highest quintile were at 28% increased risk of POAG (pooled RR = 1.28, 95% Confidence Interval, 1.07-1.55; p-trend = 0.02).

Discussion: Dietary iron intake was not associated with POAG risk; however, higher intake of iron from supplements was modestly adversely associated, possibly implicating the indications for iron supplement use compared to iron intake per se.

Conclusions: This study confirmed a prior study (1) linking iron supplements and POAG; however, given the lack of association with iron from diet alone, the association may be due to the underlying indication for iron supplement use rather than iron supplements. Further studies are warranted to clarify this relation.

Reference

(1). Wang SY, Singh K, Lin SC. The association between glaucoma prevalence and supplementation with the oxidants calcium and iron. Invest Ophthalmol Vis Sci. 2012;53(2):725-31.

81. Glaucoma Treatment Compliance Assessment Tool as a Predictive Tool for Medication Adherence

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Purpose: To determine the test-retest reliability and predictive validity of the 46-item Glaucoma Treatment Compliance Assessment Tool (GTCAT), a Likert-type questionnaire developed from the constructs of the Health Belief Model (HBM).

Methods: We included data from a multicenter study from Devers Eye Institute, University of Colorado, and Vanderbilt University. Patients used the Medication Event Monitoring System (MEMS) to hold their glaucoma medications and measure adherence over a 3-month period. Interviewers administered the GTCAT at enrollment and after a 3 month period. We determined test-retest reliability of each GTCAT question using simple correlation. Predictive validity was determined using univariate and multivariate linear regression with GTCAT questions as explanatory variables and adherence as the dependent variable.

Results: We include 91 glaucoma patients (66% female). No GTCAT questions exhibited floor or ceiling effect (greater than 90% of answers 1 or 5 on the Likert scale). Test-retest reliability using Pearson's r correlation was high with p value <0.05 for all questions. Mean and median adherence rate for the 3 month period were 88%(.26 to 1.0; SD .17) and 95%, respectively. Univariate and multivariate analysis demonstrated perceived barriers(p=0.001) and cues-to-action (p=0.023) to be associated with adherence. Stepwise regression identified perceived susceptibility (p=0.032) to also be associated with adherence.

Discussion: The adherence rate in this study is high. This may be related to monotherapy treatment, healthy volunteer bias, and the Hawthorne effect. Our study agreed with previous studies suggesting that barriers and susceptibility are associated with health related behavior. We also show an association with cues-to-action.

Conclusions: The GTCAT showed excellent test-retest reliability as well as predictive validity. Determining the factors related to adherence in individual patients could result in targeted interventions to improve adherence. Future studies will examine the ability of a shorter questionnaire to evaluate Health Belief Model constructs and their association with adherence.

82. A 7-day Clinical Study to Assess the IOP Lowering of a Novel ROCK/PGA Fixed Dose Combination in Patients with Open-angle Glaucoma and Ocular Hypertension

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Purpose: ROCK inhibitors mechanistically lower IOP by enhancing trabecular outflow. Prostaglandin agonists (PGA) facilitate IOP lowering by enhancing uveoscleral outflow. For patient convenience, we developed a fixed dose combination (FDC) of a ROCK inhibitor (AR 12286, Williams et al, 2010) and a PGA (travoprost) intended for dosing once nightly.

Methods: A double-masked, randomized, controlled study assessing the safety and ocular hypotensive efficacy of two AR-12286 (0.25% and 0.5%)/ travoprost fixed-dose combination products (PG286) compared to travoprost (Travatan® Z) in patients with elevated intraocular pressure.

Results: All 93 randomized patients completed the study. From a mean baseline IOP of 26.6 to 26.8 mm Hg, 16 hours after first dose, mean IOP was 17.7, 15.8 and 18.1 mmHg in the PG286-0.25%, PG286-0.5% and travoprost groups, respectively. This represented a mean decrease from diurnally adjusted baseline IOP of 8.9 (33%), 11.0 (41%) and 8.5 mmHg (32%), respectively. On day 7 at 08:00 hours, approximately 12 hours after the final dose, mean IOP was 17.5, 14.6 and 17.5 mmHg in the PG286-0.25%, PG286-0.5% and travoprost groups, respectively. This represented a mean decrease from diurnally adjusted baseline IOP of 9.2 (34%), 12.2 (46%), and 9.1 mmHg (34%). Mean IOP remained decreased throughout the day, with mean IOPs of 17.5, 15.0, and 17.1 mmHg, respectively at 16:00 hours. The additional IOP reduction achieved by PG286-0.5% compared to travoprost was statistically significant at each time point on Day 7. The most frequently reported events were mild to moderate conjunctival hyperemia, 32% (10/31), 59% (17/29) and 42% (14/33) in the PG286-0.25%, PG286-0.5% and travoprost groups, respectively. The incidence of conjunctival hyperemia of grade 2 or greater at Day 7 was 0%, 12% and 12%, respectively.

Discussion: The ocular hypotensive effect of PG286-0.5% was clinically and statistically greater than travoprost alone, with mean IOP less than 16 mm Hg at each time point. Hyperemia with PG286 was similar to travoprost alone.

Conclusions: PG286, a ROCK/PGA fixed dose combination, was a highly effective ocular hypotensive treatment.

Reference

Williams RD, Novack GD, van Haarlem T, et al. Ocular hypotensive effect of the Rho kinase inhibitor AR-12286 in patients with glaucoma and ocular hypertension. Am J Ophthalmol 2011;152:834-41.

83. Effectiveness of Adjunctive Topical Medication in Lowering Intraocular Pressure

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Purpose: To determine the effectiveness of second and third agents in lowering IOP by measuring the increase in IOP after discontinuation.

Methods: We included one eye from each 128 glaucoma patients under consideration for a clinical trial who were taking between zero and three topical medications. IOP was measured at one time point during the day when the subject was using usual IOP-lowering medications (IOP on treatment). Three measurements were made using Goldmann tonometry with one observer performing the measurement and the other reading the scale. All eye drops were then discontinued for at least 28 days, except for alpha-adrenergic agents (14 days) and topical carbonic anhydrase inhibitors (5 days). IOP was then measured in a similar fashion at 8 am, 12 pm, and 4 pm on the same day, and the mean of the measurements calculated (IOP off of treatment).

Main Outcome Measure: Difference between IOP off of treatment and IOP on treatment.

Results: 63 eyes in which one medication was discontinued had an increase of 5.4 ± **X.X**, 24 eyes in which two medications were discontinued had an increase of 7.3 ± **Y.Y**, and 19 eyes in which 3 medications were discontinued had an increase of 7.4 ± **Z.Z** mm Hg. 15 eyes on no IOP lowering agent had an increase of IOP of 0.2 ± 2.2 mm Hg after "discontinuation" of treatment, suggesting that comparison of one time point on treatment to 3 time points off of treatment was unlikely to have altered our findings. The 54 eyes on prostaglandin monotherapy alone had an increase in IOP from 17.1 ± 3.2 mm Hg to 22.8 ± 3.3 mm Hg, suggesting a 25% decrease in IOP from the use of the eye drop.

Conclusion: Ours is a study of the effectiveness (real world use) of IOP-lowering medications, since subjects were using their medications without regard to participation in a clinical trial when their "on medication" IOP was assessed. Discontinuation of a prostaglandin had an effect similar to that seen in clinical trials, in which adherence might be expected to be higher. However, the effectiveness of two agents was only slightly greater than one, and less than suggested by the literature, and the effectiveness of three agents was no greater than two. The benefit of second and third agents in clinical practice is likely to be small.

84. Clinical Impact of Eight Prospective, Randomized, Multicenter Glaucoma Trials

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Purpose: To determine the impact of eight multicenter randomized clinical trials (RCTs) on glaucoma practice.

Methods: An electronic survey was distributed to the members of the American Glaucoma Society (AGS). Each participant was asked two study specific questions and one standard question common to all 8 RCTs assessing the study's impact on clinical practice . RCTs included in the survey were the Advanced Glaucoma Intervention Study (AGIS), Collaborative Initial Glaucoma Treatment Study (CIGTS), Collaborative Normal Tension Glaucoma (CNTG) Study, European Glaucoma Prevention Study (EGPS), Early Manifest Glaucoma Trial (EMGT), Glaucoma Laser Trial (GLT), Ocular Hypertension Treatment Study (OHTS), and Tube Versus Trabeculectomy (TVT) Study. A 5-point Likert scale was used for rating all responses. The practice setting and duration of glaucoma practice was determined for all who responded.

Results: Two hundred and six (23.0%) of 894 AGS members participated in the survey. 46.4% were academic practitioners and 53.6% worked in a private practice setting. Mean Likert scores for the standard question evaluating the overall impact of the RCT were OHTS 4.47, CNTG Study 4.13, AGIS 3.78, TVT Study 3.53, EMGT 3.48, CIGTS 3.44, GLT 3.39, and 2.69 EGPS.

Discussion: This survey provides a subjective assessment of how 8 multicenter RCTs have influenced glaucoma practice. Our findings suggest a tendency for RCTs to be rated as having lower impact if the results show no difference between randomized treatment groups though the converse was not always true. The quality and content of the two study specific questions likely influenced the individuals' response to the third question regarding the trial's overall impact. Despite limitations relating to the conduct of the survey and interpretation of results, we believe that these findings appropriately reflect how glaucoma specialists have incorporated the results from these studies into their clinical practices.

Conclusions: Substantial differences were observed in the clinical impact of several RCTs in glaucoma. The reported impact of each study likely reflects several factors including study timing, design, conduct, and interpretation of results.

85. First-In-Human Clinical Study of a Novel Dual Mechanism Compound (AR-13324) for the Lowering of IOP in Glaucoma and Ocular Hypertension

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Purpose: AR-13324 is a Rho kinase (ROCK) inhibitor and norepinephrine transporter inhibitor designed to lower IOP in animal models through a dual mechanism of action, increasing trabecular outflow and decreasing aqueous production. In this first-in-human study, we sought to evaluate the ocular hypotensive efficacy and safety of AR-13324 ophthalmic solution dosed once-daily in the morning.

Methods: A 7-day, double-masked, randomized, vehicle-controlled, monocular study of 3 doses of AR-13324 or its vehicle in patients with elevated intraocular pressure. Entry criteria for the study included a diagnosis of open angle glaucoma (OAG) or ocular hypertension (OHT), unmedicated or post-washout IOP ≥ 24 mm Hg in one or both eyes at 08:00 hours and ≥ 21 mm Hg at 10:00, 12:00 and 16:00 hours.

Results: Mean diurnal IOP at baseline in the 85 enrolled patients was 24.3 to 25.6 mm Hg. After a week of dosing, all active groups experienced IOP reductions that were significantly different from vehicle at all time points ($p = 0.018$ to <0.001). Peak reduction occurred at 8 hours after the final morning dose, ranged from 6.1 to 7.2 mm Hg relative to baseline, and appeared to be continuing downward. IOP reduction at trough (24 hours after dosing) was 5.6 to 6.3 mm Hg relative to baseline. Mild (+1) to moderate (+2) conjunctival hyperemia was the most prevalent biomicroscopic finding, occurring in 50% (11/22), 71% (15/21) and 90% (17/19) of patients in the AR 13324 0.01%, 0.02%, and 0.04% treatment groups, respectively, 8 hours following the first instillation of study medication. By the 7th day of dosing, the incidence of mild to moderate conjunctival hyperemia was 18% (4/22), 29% (6/21), and 50% (9/18), respectively.

Discussion: AR-13324 0.01% to 0.04% q.d. (AM) produced large reductions in IOP that were statistically and clinically significant and lasted at least 24 hours after dosing, with 0.02% AR 13324 appearing to reach the top of the dose response curve. IOP decreased steadily for 8 hours following dosing, suggesting that peak efficacy may occur beyond 8 hours. The only safety finding of note was dose-related ocular hyperemia that declined in incidence and severity with repeated dosing.

Conclusions: AR-13324, with its dual mechanism of action, shows promise as a novel ocular hypotensive agent for the treatment of glaucoma.

86. Glaucoma Severity and Medication Adherence in a County Hospital Population

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Purpose: To assess the association between disease severity and adherence with glaucoma medications in a county hospital population.

Methods: In this cross-sectional study, 126 patients diagnosed with glaucoma receiving intraocular pressure lowering medication were recruited from the San Francisco General Hospital Ophthalmology Clinic. Subjects completed an oral questionnaire to assess demographic information, knowledge of glaucoma, and perceptions of glaucoma medication adherence. Glaucoma disease severity was classified according to the American Academy of Ophthalmology's Preferred Practice Pattern guidelines. Medication adherence was measured for each patient by obtaining pharmacy refill data and calculating medication possession ratio (MPR)-ratio of total days' supply of medication during a 365-day period. Adherence was measured retrospectively over the 18-month period prior to study entry. Subjects with a MPR > 80% were considered adherent.

Results: Subjects with mild or moderate glaucoma were more likely to be non-adherent to their prescribed glaucoma medications than those with severe disease (adjusted OR, 1.54; 95% CI, 1.03-2.31; P = 0.04). Age, gender, race, education level, years of glaucoma, number of medications and glaucoma diagnosis were not found to be statistically significantly associated with adherence.

Discussion: Patients with severe glaucoma were more likely to adhere to their topical IOP lowering medication regimen than those with milder glaucomatous disease.

Conclusions: This study provides the first evidence suggesting glaucoma severity may impact patient adherence to glaucoma medications. Given the weight of evidence showing the benefits of IOP lowering therapy in preventing glaucomatous disease progression, it is far more likely that greater disease severity results in better compliance with therapy, rather than greater adherence resulting in more severe disease, a result which is not surprising given that early to moderate glaucomatous disease is often asymptomatic.

87. The Long-term Effect of High-dose Antioxidants on Intraocular Pressure in the Age-related Eye Disease Study (AREDS)

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Purpose: Oxidative damage to trabecular meshwork may compromise aqueous outflow, subsequently increasing intraocular pressure (IOP). Here, we assess if high-dose antioxidants vs. placebo affected IOP at baseline, 5 and 10 yrs.

Methods: The dbGaP AREDS dataset, a longitudinal randomized clinical trial of high-dose antioxidants for prevention of age-related macular degeneration (AMD) and cataract was used in analysis. Glaucoma was an exclusion criterion to enrollment. The AREDS regimen consisted of 15 mg of beta-carotene, 500 mg of vitamin C, 400 IU of vitamin E, and 80 mg of zinc oxide. In analyses, participants reporting glaucoma during follow-up were excluded to minimize possible effects of glaucoma treatment on IOP. General linear models (SAS, v9.3 Cary, NC) were used to assess the effect of antioxidant treatment group (placebo vs. antioxidants; zinc; and antioxidants plus zinc) on IOP at baseline, 5 and 10 yrs, adjusting for sex, age at enrollment, self-report of diabetes and hypertension at baseline, and Centrum use. Right eyes were included in the analyses.

Results: Among 3017 analyzed subjects, 1680 (55.7%) were female, mean age was 69.2 ± 5.0 yrs. Adjusted IOP in each treatment group was not statistically significantly different from placebo (p = 0.81, baseline; p = 0.70, 5 yrs; p = 0.43, 10 yrs; Table 1). Sensitivity analysis including participants who reported glaucoma, adjusting for glaucoma status (yes, no, suspect) yielded similar results.

Discussion: In AREDS, IOP was similar at baseline, 5 and 10 yrs within each treatment group. Comparing treatment groups, there was no significant difference in IOP between groups at baseline, 5 or 10 yrs; however, a survival effect may exist, biasing results towards the null.

Conclusion: AREDS antioxidants prevent progression of AMD; basic and epidemiologic research suggests the protective antioxidant effects against glaucoma. This study represents the first epidemiologic analysis of high-dose antioxidants in a clinical trial, and fails to support protective effects of antioxidants against glaucoma through an IOP reduction. Further research is necessary to determine if antioxidants are protective against glaucoma, and if optic nerve protection is through a different mechanism.

Table 1: Mean Intraocular Pressure (IOP) at Baseline, 5 years and 10 years for Each Treatment Group

Treatment Group	Mean IOP (95% CI) at Baseline in mmHg	Mean IOP (95% CI) at 5 Years in mmHg	Mean IOP (95% CI) at 10 Years in mmHg
Placebo	15.8 (15.6-16.0) n = 927	15.7 (15.5-15.9) n = 719	15.5 (15.3-15.8) n = 582
Antioxidants	15.9 (15.7-16.2) n = 934	15.8 (15.6-16.0) n = 739	15.8 (15.6-16.1) n = 618
Zinc	15.8 (15.6-16.1) n = 579	15.7 (15.4-16.0) n = 458	15.6 (15.4-16.0) n = 365
Antioxidants and Zinc	15.9 (15.6-16.1) n = 577	15.9 (15.6-16.2) n = 435	15.8 (15.5-16.1) n = 357

88. The Effects of Benzalkonium Chloride and Tafluprost on Human Trabecular Meshwork Cells

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Purpose: The effects on cellular metabolic activity of preservative free tafluprost and benzalkonium chloride (BAK) in primary human trabecular meshwork (HTM) cells were studied.

Methods: Primary HTM cells were treated with various BAK and tafluprost free acid concentrations over multiple exposure times, and cell viability was measured with the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenol tetrazolium bromide (MTT) assay. HTM cells were co-treated with BAK and tafluprost free acid for 30 min and cell viability was assessed. All data are reported as the mean ± standard deviation of three or more experiments.

Results: BAK treatment induced a time- and dose-dependent reduction in HTM cellular metabolic activity. With the exception of 0.001% for 30 min, all times and concentrations were significantly different ($p<0.05$) from medium-treated controls. After the 30 minute treatment, cell viabilities dropped to 888%, 787%, 589%, and 276% for 0.001% BAK, 0.002% BAK, 0.003% BAK, and 0.004% BAK, respectively. Tafluprost treatment did not impair cellular metabolic activity. There was no significant effect for any of the concentrations and times of tafluprost tested. Cells treated with 0.0001 mM, 0.001 mM, 0.003 mM, 0.03 mM and 0.3 mM tafluprost for 30 min had cellular activities of 94%, 90%, 90%, 90%, and 91% respectively. Co-treatment of BAK with tafluprost showed an increase in cellular metabolic activity as compared to BAK treatment alone. With 0.003% BAK treatment alone, the cellular activity was 498%, whereas for 0.003% BAK plus 0.3 mM tafluprost treatment it was 595%.

Conclusion: Human HTM cells were very sensitive to the detrimental effects of BAK at low concentrations and exposure times. Tafluprost at low concentrations and doses had no apparent effect on the cellular metabolic activity of these cells. The presence of tafluprost attenuated the negative effect of BAK on the primary HTM cells.

89. Feasibility of Telepresence in Glaucoma Care

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Purpose: Telepresence allows remote access to patient data in near real time (NRT). The aim is to test the feasibility of stereoscopic evaluation of the Optic nerve head (ONH) in glaucoma suspects and patients remotely and in NRT using a novel system for telepresence.

Methods: Simultaneous stereoscopic ONH images captured during telemedicine screening using a Kowa Wx3D 12 megapixel camera (Kowa Optimed, Inc, Tokyo, Japan) were assessed twice in random order, once on-site and then after transmission to a remote site using purpose built software (Second Opinion Telemedicine Solutions, Torrance, CA). Images were viewed on a 1440x900 pixel, 32bit resolution monitor in a standardized fashion in a dark room using a Stereo-viewer. Vertical cup to disc ratio (VCD), referral recommendation (score 1 is <1m, 2 is 1-3m, 3 is >3m), and image quality (score 0=worse, 5=best) were determined. Data on speed of transmission and file compression were collected. Means, T test, and Intra-class correlation coefficient (ICC) were used to compare image VCD, referral outcomes, and image quality before and after transmission.

Results: A total of 56 stereo images were assessed. Speed of image transmission was 5-30 sec using 4G wireless connection. Mean image size after transmission was 88Kb. VCD, referral recommendation, & image quality on-site and after transmission are included in Table 1. The system allowed remote assessment and feedback on all images.

Discussion: This pilot study assessed the feasibility of performing NRT stereoscopic evaluation of the optic nerve in glaucoma patients from a remote site. The measured parameters were comparable with no degradation in image quality.

Conclusions: Telepresence solutions are possible with NRT stereoscopic evaluation of ONH images. The applications of telepresence and the impact on patient care deserve continued study.

Table 1. Image characteristics on-site and by telepresence

	VCD	Referral Score (1-3)	Image Quality Score (0-5)
On-Site: Mean/SD	0.65+/-0.24	1.7+/-0.85	4.68+/-0.55
Telepresence: Mean/SD	0.70+/-0.25	1.7+/-0.86	4.64+/-0.56
p=	0.88	0.90	0.81
ICC	0.981	0.927	0.586

90. Bacterial Contamination of Preservative-free Eye Drops in Single-use Vials of Talfluprost

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Purpose: To investigate the incidence of bacterial contamination of preservative-free tafluprost (ZIOPTAN, Merck & Co., Inc., Whitehouse Station, NJ) after a single exposure to normal eyelid flora.

Patients and Methods: Forty-three eyes were evaluated in this study. Subjects were excluded if they had used topical ophthalmic or systemic antibiotics within the past 4 weeks, preservative-free ophthalmic drops within the past 2 hours, ophthalmic drops with preservatives within the past 12 hours, or ophthalmic ointments within the past 24 hours. Drops of tafluprost were first applied to chocolate and Saboraud plates. The open tip of the tafluprost vial was then exposed to the participant's eyelashes, and drops from this vial were inoculated onto new plates (Day 0). A separate flock swab elsewhere on the eyelashes was also cultured. Tafluprost from the contaminated vials was also inoculated onto both types of plates 1 day and 6 days later. Using standard microbiological techniques, the plates were incubated and evaluated. Frequency and speciation of microbial growth on contaminated plates was recorded. A stepwise logistic regression was used to identify risk factors associated with microbial contamination.

Results: Of the 43 subjects, 35 (81%) flock swabs obtained from 43 subjects showed bacterial growth. Vials from 2 subjects showed pre-contamination, and those plates were discarded. Of the 41 remaining vials, 53.7% (22 vials) showed growth on Day 0. After 24 hours (Day 1), 14.6% (6 vials) exhibited growth. After 144 hours (Day 6), 7.3% (3 vials) exhibited growth. A total of 8 types of bacteria were cultured; the most common were coagulase-negative Staphylcoccus species (82.7%) and Staphylcoccus aureus (6.5%). There were no risk factors identified for growing bacteria.

Discussion and Conclusion: Twenty-four hours after contamination by eyelashes, cultures of preservative-free tafluprost demonstrated bacterial growth in 14.6% of samples. At 6 days, only 7.3% had bacterial growth. A limitation of this study is that the vials were not re-exposed to eyelids/eyelashes every day, as may occur with multiple dose administrations, and hence we cannot extrapolate to what happens after multiple re-exposures.

91. Phase 3 Randomized 3-month Trial with an Ongoing 3-month Safety Extension of Fixed-combination Brinzolamide 1%/brimonidine 0.2%

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Purpose: This study compared the intraocular pressure (IOP)-lowering efficacy of fixed-combination brinzolamide 1%/brimonidine 0.2% (BBFC) with that of its component medications in patients with open-angle glaucoma (OAG) or ocular hypertension (OH).

Patients and Methods: This was a phase 3, parallel-group, double-masked, multicenter, 3-month study with a 3-month safety extension. After a washout period, eligible patients were randomized 1:1:1 to treatment with BBFC, brinzolamide, or brimonidine 3 times daily. IOP was assessed at 8 AM, 10 AM, 3 PM, and 5 PM at 2 weeks, 6 weeks, and 3 months after treatment. The primary objective was to determine whether the IOP-lowering efficacy of BBFC was superior to that of either monotherapy.

Results: A total of 690 patients were enrolled. Baseline mean IOP levels were similar among the 3 treatment groups. At 3 months, mean IOP of the BBFC group was significantly lower than that of either monotherapy group ($P \leq .005$) across all time points. At 3 months, the BBFC group demonstrated the largest IOP reduction from baseline at all time points (21%-32%) compared with the brinzolamide group (17%-22%) and the brimonidine group (13%-25%). A total of 143 patients experienced at least 1 treatment-related AE (BBFC, 26%; brinzolamide, 19%; brimonidine, 17%). The most common BBFC-related AEs were eye irritation (5.4%), vision blurred (4.5%), and eye allergy (4.5%).

Discussion: This study demonstrated that BBFC, the first FC therapy that does not include timolol, has superior IOP-lowering activity compared with either brinzolamide or brimonidine in patients with OAG or OH while providing a safety profile consistent with that of its individual components.

Conclusion: BBFC offers a non-beta blocker, non-PGA alternative to current FC therapies.

92. Potential Role E-mail and Text Messaging in Improving Adherence?

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Purpose: Long-term adherence to glaucoma medications is relatively poor. E-mail and text message reminders have been used to improve adherence in other disciplines, and similar strategies have been suggested for glaucoma patients. Given the older age of glaucoma patients and potential hurdles to adoption of technology, we designed this study to determine if glaucoma patients could use either emails or text messages to improve adherence.

Methods: We administered a cross sectional survey to 1013 consecutive glaucoma patients at a private glaucoma subspecialty practice in 3 mid-Atlantic locations.

Results: Of the 989 patients over 18 with complete information, 428 (43.3%) were male, 749 (75.7%) were Caucasian, 195 (19.7%) were African American. The mean age was 68 +/- 14 years and the mean household income as determined by zip code was 49750 +/- 14243. 177 (17.9%) lived in an urban area, 575 (58.1%) suburban, and 236 (23.9%) rural. 892 patients (90.2%) had a high school education, 397 (40.1%) also had a Bachelor's degree, and 198 (20.0) had an additional post-graduate degree. 671 (67.8%) reported any internet use at home, and only 442 patients (44.7%) of patients reported checking the internet at least daily. 554 (56.0%) patients knew how to open attachments. 404 (40.8%) patients reported that an email reminder would help them remember appointments and 185 (18.7%) reported that an e-mail reminder would help them with medications. 749 (75.7%) of patients reported owning a cell phone but only 406 (41.1%) knew how to open a text message. 280 (28.3%) patients reported that a text message would help them remember appointments and 193 (19.5%) reported that a text message would help with medications. Younger age ($p = 0.021$, $p = 0.001$, $p=0.000$) cell phone use ($p=0.022$, $p=0.033$), internet use ($p=0.001$, $p=0.001$) knowledge of text messaging ($p= 0.000$, $p = 0.000$) and the internet ($p= 0.023$, $p= 0.000$), and higher level of education ($p = 0.020$) were all associated with the potential to increase adherence.

Discussion: Glaucoma patients may be less proficient in the use of e-mails or text messaging, due to older age and lack of familiarity with this technology. In this large series, the majority of glaucoma patients report that they would not benefit from e-mail or text messaging reminders for their appointments or medication. However, younger patients with glaucoma, particularly those under the age of 40 reported that text messaging and e-mail could be an effective ways to improve adherence. Other technologies or strategies must also be employed.

Conclusions: E-mail and text messaging reminders may not be effective ways to improve adherence in the general glaucoma patient population, but may be useful in younger patients with glaucoma.

93. Regional and Physician-level Variation in Rates of Laser Trabeculoplasty in the Medicare Population

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Purpose: To determine the magnitude of regional and physician-level variation in the performance of laser trabeculoplasty (LTP).

Methods: We studied a 5% sample of all Medicare beneficiaries aged 65 years or older with continuous Part B (medical insurance) coverage and no enrollment in an HMO who were seen by an ophthalmologist for diagnosed or suspected open-angle glaucoma (OAG) in 2005. We counted unique ophthalmologist-billed claims with CPT code 65855 (LTP). We used the number of patients seen for known or suspected OAG in one year as an indicator of ophthalmologists' glaucoma practice volume and ophthalmologists' year of graduation from medical school to calculate years of experience. We examined overall and ophthalmologist-specific rates of LTP performed in 9 large geographic regions.

Results: Out of all ophthalmologists seeing patients for known or suspected OAG in 2005, 16.2% performed one or more LTPs in 2005. There was significant variation in the proportion of ophthalmologists within each region who performed LTP ($p < 0.001$), with a high of 18.9% in the East North Central region and a low of 10.9% in the Mountain region. Among patients of ophthalmologists who performed LTP, there was significant regional variation in the median rates of LTP performed per patient ($p < 0.005$, Kruskal-Wallis test) with a high of 18.2 per 100 patients in both the Mountain and East South Central regions and a low of 11.8 per 100 patients in New England. Median rates of LTP performed per patient varied by ophthalmologists' years of experience, with higher rates among ophthalmologists with up to 10 years of experience compared to those with more than 10 years of experience ($p < 0.001$, Kruskal-Wallis test). The distribution of level of experience of ophthalmologists varied by region. The Mountain region had the highest proportion of ophthalmologists with up to 10 years of experience (16.5%) and New England had the lowest proportion (4.9%). Median rates of LTP performed per patient also varied by practice volume, with higher rates among ophthalmologists seeing fewer patients in 2005 for known or suspected OAG compared to those seeing a greater number of patients in 2005 ($p < 0.0001$, Kruskal-Wallis test).

Conclusions: The proportion of ophthalmologists performing LTP and the rates of LTP performed on Medicare beneficiaries vary by region in the United States. LTP rates are higher for ophthalmologists with less than 10 years of experience compared to more experienced ophthalmologists. LTP rates are higher for ophthalmologists seeing a low volume of OAG patients compared to those seeing a high volume.

94. Evaluation of Self-Administration of Eye Drops among Glaucoma Patients in Ghana

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Purpose: Glaucoma is the second most common cause of blindness, and Ghana has the second highest prevalence of glaucoma in the world. Eye drops are commonly used for the treatment of glaucoma. Previous studies of evaluating self-administered eye drops among predominantly White patients with glaucoma have discussed the need of developing effective strategies for teaching patients how to use their eye drops properly. Evaluation of self-administration of eye drops among glaucoma patients in Ghana has not been conducted. The purpose of this study is to evaluate the proper self-administration of eye drop medications among patients of ocular hypertension and glaucoma in Ghana.

Methods: This was a prospective, non-randomized observational study at two private practice sites in Accra, Ghana. Those who had been self-administering eye drops at least for one month after the diagnosis of glaucoma or ocular hypertension were eligible. Participants responded to a questionnaire about the use of their eye drops and self-administered eye drops while being video-taped. Participants reviewed the video-recording, discussed their findings and questions and received one-on-one demonstration session.

Results: A total number of 238 participants, with the median age of 61±15 years (a range of 20 to 90 years; 59% females), were interviewed with a video-recording session. 212 (89%) reported to have self-administered eye-drops on a daily basis. 236 (99%) responded to have successfully applied their eye drops. 190 (80%) in fact successfully administered eye drops into at least one of their eyes. 185 (78%) reported during their session that the tip of bottle did not touch the eye. Upon the review of video recordings, only 68 (36%) of those who reported to have self-administered without touching the tip provided a matching response.

Discussion: The effectiveness of medical treatment for glaucoma relies largely on self-administration of eye drops. Consistent with a previous study in the US, self-report of the self-administration of eye drop is poor among the participants in Ghana. In addition, 125 of 238 (53%) reported no previous instruction on the proper use of the eye drop medication.

Conclusions: Patients' self-evaluation on the self-administration of their eye-drop medications was mostly inaccurate. Providing a training session on the proper use of eye drops will improve the technique of self-administration. A future study should focus on post-training evaluation in this group of patients.

References

Robin AL, Novack GD, Covert DW, Crockett RS, Marcic TS. Adherence in glaucoma: objective measurements of once-daily and adjunctive medication use. American Jour of Ophthal 2007;144:533-40.

Sleath BS, Blalock S, et al. The relationship between glaucoma medication adherence, eye drop technique, and visual field defect severity. Ophthalmology 2011;118(12):2398-2402.

Stone JL, Robin AL, Novack GD, Covert DW, Cagle GD. An objective evaluation of eyedrop instillation in patients with glaucoma. Arch Ophthalmol 2009;127:732-6

95. Evaluation of IOP-lowering Ophthalmic Drop Administration Technique

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Purpose: Poor adherence with topical medications is well-established and is further complicated by poor administration technique. Eye drop administration by patients was evaluated on multiple visits in the setting of a randomized IOP-lowering trial.

Methods: In a 3-month, multicenter, investigator-masked trial, patients with glaucoma or ocular hypertension were randomized to 1 of 3 topical IOP-lowering medications. At baseline, a questionnaire was given to patients to self-assess perception of difficulty with drop administration. At baseline and 12 weeks, each patient's technique was observed and difficulty with administration, defined as bottle touching eye/adnexa, missing the ocular surface or excess drops, was recorded.

Results: Of 164 enrolled pts (mean age 64.3 yrs), 50% had previously been treated with IOP-lowering medication for ≥3 yrs. Only 11.4% of patients reported difficulty with eye drop administration at study entry. At baseline, 18.2% of patients touched their eye/adnexa with the bottle and 10.3% missed the eye. At 12 weeks, 18.5% and 8.6% of patients, respectively, showed similar difficulties. Overall, difficulty with drop instillation was observed in 42.1% of patients at 1 or more visits. Difficulty at both visits was seen in 35.3% of those who reported difficulty at entry and in 17.2% of patients who denied any difficulty. The relative risk of having difficulty with drop administration at week 12 was 3.8 x greater for individuals with observed difficulty at baseline ($p < 0.01$). The relative risk of demonstrating difficulty at either visit was 2 x greater for patients who self-reported difficulty with drop administration at entry ($p = 0.004$).

Discussion: These study results with supervised observation within a clinical trial may represent a best-case scenario in eye drop administration. Observed difficulty with administration as well as self-reported difficulty with administration both increase the likelihood of patients having difficulty with future eye drop administration.

Conclusions: Patients with experience instilling topical glaucoma medications continue to have difficulties with eye drop administration, including patients who do not self-report difficulty.

96. Effects of Subconjuctival Triamcinolone Acetonide on IOP after Ahmed Glaucoma Valve Implantation in Patients with Uveitis

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Purpose: To determine if intra-operative subconjuctival injection of Trimacinolone Acetonide (*SCTA)* during Silicone Ahmed Glaucoma Valve (SAGV) implantation alters postoperative IOP in patients with uveitic glaucoma.

Methods: Retrospective chart review from a single physician glaucoma practice. A total of 90 eyes were selected according to CPT code for the procedure and were divided into 3 groups according to *SCTA* injection (20mg/0.5ml): no injection (n=19), inferior fornix (n=19) or injection over the plate of the valve (n=52). IOP was recorded at six time points up to 12 months and compared among groups. Groups were also compared with regard to the number of glaucoma medications and rate of complications.

Results: Postoperative IOP variations and survival rates of SAGV (success defined as IOP < 21 with or without antiglaucoma medications) were compared. At one month, SAGV success was recorded in 71% in SCTA over the plate group compared to 53% in the SCTA in the inferior fornix and 37% in no SCTA, declined at 6 months to 56% in STK over the plate, 32% in STK in the inferior fornix and 21% in no STK ($p=0.01$) and remained stable up to 1 year. IOP: (no injection/inferior fornix/over the plate injection groups) were 20.0/18.8/15.6 at one month, 16.8/20.8/15.7 at six month and 17/16.2/18.1 at 12 months. The average number of postoperative antiglaucoma medications was 1.4+/-1.2, no SCTA group, 1.1+/-1.6, SCTA inferior fornix and 0.75+/-0.1 in SCTA over the tube plate, ($p=0.09$).

Discussion: Surgical success rate of SAGV was significantly higher in the group of SCTA over the tube plate, even though IOP difference was not statistically different among groups. Number of postoperative medications was reduced in the SCTA group with 49% of patients not using any topical medications after surgery.

Conclusions: Intra-operative SCTA over the plate of SAGV appears to be a safe option to reduce postoperative hypertensive phase and increase the success rate of the SAGV in uveitic glaucoma, including NVG, compared to implantation without SCTA. Further prospective investigations are warranted to elaborate these findings.

97. Study of Effect of Topical Anesthetics on Intraocular Pressure Measured by Rebound Tonometry in Human Volunteers

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Introduction: Topical anesthetics have been shown to affect the episcleral venous pressure and intraocular pressure (IOP) in rabbits. The purpose of the current study was to examine the effect of commonly used topical anesthetics on intraocular pressure measured by rebound tonometry (RT) in human volunteers.

Methods: This was a prospective, three day, masked study of volunteers with a normal anterior segment examination, not currently using any topical medications and with no prior ocular surgeries. On one day (n=42), IOP was measured without any topical anesthetic using RT (ICare® tonometer). Proparacaine hydrochloride, 0.5% was administered into the right eye and benoxinate hydrochloride, 0.4% (with 0.25% fluorescein sodium) into the left eye. IOP was measured with RT at 1 minute and 5 minutes after administration of topical anesthetics by a second masked observer. IOP at 5 minutes also was measured by Goldmann applanation tonometry (GAT) by a third masked observer. On a separate day (n=23 of the 42 volunteers) RT IOP was obtained at 0, 1 and 5 minutes without instillation of any drops. On a third day (n=22 of the 42 volunteers) RT IOP was obtained at 0, 1 and 5 minutes after administration of preserved artificial tears.

Results: In proparacaine-treated eyes, both the 5 min RT IOP (14.7 ± 3.6 mmHg, mean SD) and 5 min GAT IOP (15.1 ± 3.5 mmHg) were significantly lower than the 0 min RT IOP (mean 16.3 ± 3.9 mmHg, RMANOVA p value<0.0001). In benoxinate-treated eyes 5 min RT IOP (14.8 ± 3.7 mmHg) and 5 min GAT IOP (15.1 ± 3.4 mmHg) were significantly lower than 0 min IOP (16.2 ± 4.0 mmHg, RMANOVA p<0.001). In eyes treated with artificial tears, a significant reduction in the 1 and 5 minute RT IOP measurements (mean 13.7 ± 3.1 mmHg and 13.1 ± 3.2 mmHg respectively) was observed as compared to 0 min RT IOP (mean 14.7 ± 3.7 mmHg, RMANOVA p value = 0.0001). There was no significant difference between baseline (15.4 ± 2.8 mmHg) and, the subsequent 1 min and 5 min RT IOP measurements (15.0 ± 2.6 mmHg and 15.9 ± 2.7 mmHg, respectively) in the eyes in which no drops were administered. Bland Altman plots showed a good correlation between 5 min RT IOP and GAT IOP (mean difference = 0.2 ± 2.1 mmHg).

Discussion: Topical drop administration, whether anesthetic or artificial tears was found to be associated with lower RT IOP readings after 5 minutes. No change in IOP was observed with repeat measurement with RT when no topical drops were used.

Conclusions: Changes in the tear film and corneal biomechanical properties after eye drop administration are potential mediators of this phenomenon that need to be further evaluated. Eyedrop administration can introduce systematic changes in IOP measurement, which needs to be considered when designing clinical trials with IOP related endpoints.

98. Adherence and Persistence on Bimatoprost 0.01% versus Bimatoprost 0.03%

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Purpose: To compare adherence and persistence to bimatoprost 0.01%, a new formulation that maintains IOP-lowering efficacy and has an improved tolerability profile, with that of the original 0.03% bimatoprost formulation.

Methods: Pharmaceutical claims from a major, longitudinal database of prescription and medical claims for >115 million patients were analyzed. Treatment-naïve patients initially prescribed bimatoprost 0.01% or 0.03%, between April and June 2011, were identified. Treatment-naïvety was defined as no glaucoma medication claims during the prior 18 months. Persistence over 12 months was assessed using Kaplan-Meier survival analyses assuming a 30-day grace period. Adherence was measured using the mean and median proportion of days covered (PDC), and proportions of patients with PDC≤0.2 and >0.8.

Results: 5,431 patients met the inclusion criteria for the persistence analyses. Persistence on bimatoprost 0.01% was significantly better with 28.2% [95%CI: 26.7%-29.7%] of patients still on treatment at 12 months versus 17.4% [95%CI: 15.7%-19.4%] for bimatoprost 0.03%, P<0.001. 4,197 patients met the inclusion criteria for the adherence analyses. Adherence to bimatoprost 0.01% was superior to that of 0.03% across multiple measures. Mean (median) PDC for the 0.01% was 0.543 (0.512) compared with 0.443 (0.356) for 0.03%, P<0.001. The proportion of low-adherers (patients with PDC≤0.2 over 12 months) was significantly lower for bimatoprost 0.01% (20.0%) versus 0.03% (27.3%), P<0.001. Moreover, the proportion of high-adherers (patients with PDC>0.8 over 12 months) was significantly higher for bimatoprost 0.01% (29.0%) versus 0.03% (17.5%), P<0.001. Significant differences between agents in adherence and persistence were maintained in the subgroup ≥65 years of age.

Discussion: Bimatoprost 0.01% demonstrated superior persistence and adherence versus 0.03% in the overall cohort as well as a subgroup of those ≥65 years of age.

Conclusions: The improved tolerability of bimatoprost 0.01% compared with the original formulation of bimatoprost 0.03% is accompanied by significantly longer persistence and better adherence to therapy for treatment-naïve patients.

99. To Investigate the Relationship between Socio-demographic Factors and Non-persistence with Topical Glaucoma Medications

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Purpose: To investigate the relationship between socio-demographic factors and non-persistence with topical glaucoma medication.

Design: Cross-sectional study

Participants: Glaucoma patients on medical therapy from the Yorkville Eye Clinic (YEC), a general ophthalmology practice in Toronto (n=61).

Methods: Patients attending YEC for scheduled glaucoma visits were recruited weekly between Nov. 2011 and Apr. 2012. Study participants completed a socio-demographic information questionnaire. Pharmacy records of dates and quantities of glaucoma medications dispensed in the last year were obtained. From these records, cumulative numbers of gaps and days off therapy were calculated. Non-persistence was defined as having ≥1 gap in therapy. Based on expert consensus (G. Trope, MB, PhD, FRCSC; Y. Buys, MD, FRCSC, oral communication, Dec. 2011), a gap was considered to be ≥14 days without medication. Differences in persistence between socio-demographic groups were statistically tested with Chi squared or Fisher's Exact test. Differences in median numbers of days off therapy were statistically tested with the Wilcoxon test. The prevalence ratio (PR) and 95% confidence interval (CI), derived from a log Poisson regression model, were used to assess the association between factors examined and the risk of non-persistence.

Results: The median age of study participants was 72; the median time since diagnosis was 7 years; 61% were male and 71% were on a monotherapeutic medication regimen. In total, 54% of patients (n=33) were non-persistent with their glaucoma medications in the last year. Median numbers of gaps and days off therapy were 1 and 52, respectively. Self-reported, below average income was associated with approximately 2 times higher likelihood of non-persistence (PR 1.92, 95% CI 1.33-2.78, $p<0.01$). It was also marginally significantly associated with a greater median number of days off therapy (p=0.07). Furthermore, not having basic needs met by monthly family income was marginally significantly associated with non-persistence (p=0.06). Non-persistence was greater for individuals who were: diagnosed ≤1 year (p=0.21); not married (p=0.47); not Caucasian (p=0.76); not born in Canada (p=0.47); did not have English as a first language (p=0.20); and had moderate/severe glaucoma according to Harvey Visual Field testing (p=0.50). These differences were not statistically significant. Approximately 82% of participants indicated that they obtained refills when existing medications were nearly depleted.

Discussion: Over half the sample was non-persistent. Below average income was significantly associated with objectively measured non-persistence.

Conclusion: Socio-economic barriers to medication persistence may interfere with long-term glaucoma management.

100. Quality of Life in Veterans Using Glaucoma Drops: Health Care Disparities

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Purpose: Dry eye syndrome is a common condition that has a higher prevalence in glaucoma patients from prolonged exposure to topical medications. This study looks at the ocular surface problems in glaucoma patients and effect on quality of life (QOL) measures. Additionally, it examines the differences in these measures among different racial groups.

Methods: Study population: Patients seen in the Miami VA eye clinic by an ophthalmologist or optometrist between June and August 2010, were invited to complete two questionnaires at the time of their visit, the Dry Eye Questionnaire 5 (DEQ5) and the Impact of Dry Eye Living Questionnaire (IDEEL). Of 1348 patients seen in the Miami VA eye clinic during the three month period, 29% (n=391) elected to fill out both the DEQ5, IDEEL. Main outcome measures: The main outcome measures included ocular surface symptoms and their associated impact on functionality in patients using glaucoma medications compared to patients not on such medications.

Results: In our cohort, there were 353 patients using glaucoma medications and 114 patients not using glaucoma medications. No significant differences were noted in the demographic characteristics with regards to age, gender, and ethnicity in those using and not using glaucoma medications (Table 1). Patients taking glaucoma medications had a significantly higher percentage of severe dry eye (by DEQ5>11) than patients not taking glaucoma medications. (Table 2) Significantly more black patients were taking glaucoma drops compared to white patients. No significant difference was seen between patients identified as Hispanic (n=62) compared to white patients. When IDEEL scores were examined, patients on glaucoma drops had significantly lower score for emotional well-being, but not for capacity to work or performance of daily activities. The emotional well-being score also decreased in patients with increasing number of drops. Black patients had significantly lower IDEEL scores based on number of glaucoma drops, and black patients on 4 topical medications had a score more than 25 points lower than their white counterparts on the same number of drops.

Discussion: Glaucoma patients suffer a higher rate of dry eye syndrome than non glaucoma patients, which subsequently results in a decrease in the quality of life. Black patients have a higher rate of glaucoma and based on the Impact of Dry Eye Living Questionnaire (IDEEL), have lower scores than white patients with the same number of glaucoma drops. This suggests that quality of life is affected more greatly in black patients receiving topical medications for glaucoma.

Conclusions: Our data indicate that glaucoma is strongly associated with ocular surface disease, and it is important to note the decrease in quality of life related to the usage of glaucoma drops. Our study demonstrates that there are racial disparities in quality of life secondary to glaucoma.

101. Frequency of Intervention in Stable Glaucoma Patients

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Purpose: In order to minimize disease progression, chronic glaucoma patients require life-long follow up examinations at regular intervals. In practice, many of these appointments yield stable results and hence promote continuation of the current management plan. Clinical evidence of worsening disease, however, often demands modification of treatment regimens. The purpose of this study is to elucidate what percentage of routine follow ups yield unstable clinical findings, which patients are unstable, and what the most common treatment changes are.

Methods: This is a prospective cohort study of 630 patients with chronic glaucoma who were seen at Sunnybrook Health Sciences Centre over a 3 month period, where a total of 2505 patient appointments occurred. Only routine visits, with no treatment modification implemented at the prior visit, were included in the study. The primary outcome of the study was the proportion of unstable patients requiring altered treatment regimens over the study period. The characteristics of unstable patients including diagnosis and the clinical reason for treatment change; as well as the most common treatment alterations that occurred, were also examined.

Results: The percentage of patients that were deemed clinically unstable and thus required adjustment of the treatment plan was 21% overall (131 of 630 patients). Twenty-three percent of patients with primary open angle glaucoma (POAG) were unstable, versus 32% of pseudoexfoliation glaucoma (PXG), 13% of ocular hypertensives, 15% of glaucoma suspects and 5% with other variable diagnoses. The most common unstable clinical finding was IOP, which accounted for 51% of treatment changes. Visual field progression, visual acuity changes, symptoms and optic nerve head changes were seen in 25%, 20%, 11% and 7% of unstable patients respectively. The most common treatment modification was medication change in 34% of patients. Laser procedures, surgical intervention, referral and repetition of clinical tests were carried out in 19%, 17%, 11% and 10% of unstable patients respectively.

Discussion: Over twenty percent of patients with chronic glaucoma and related diagnoses require alterations of treatment regimens at routine follow up visits. The most common diagnoses to result in an unstable visit were POAG and PXG. Most often due to increased IOP, the majority of these patients were managed by changes in medication, followed by laser procedures and surgical intervention.

Conclusions: This study suggests that a significant minority of presumably stable patients require treatment modification and thus vigilance at follow up visits is favorable.

102. Improving Access and Cycle Time through a Hospital Based Tele-glaucoma Program

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Purpose: To compare access time and cycle time between a new hospital-based tele-glaucoma program[1] and traditional in person glaucoma consultation.

Methods: This was a prospective comparative study of 71 patients seen through the tele-glaucoma program and 63 seen via traditional exam with a physician present. Access time was calculated as the time from patient being referred to the date of their booked visit for either a tele-glaucoma or traditional in-person exam. This information was collected prospectively. Cycle time was defined as the time from registration until departure. It was calculated for the subset of patients from each study group who completed activity logs on the day of their visit.

Results: The mean access time was significantly shorter for patients seen through tele-glaucoma as compared to in-person exam: 45 ± 22 days, n=68, range 13 - 121days vs. 88 ± 47 days, n=63, range 27-214 days; $p<0.0001$. The cycle time was reduced for patients seen through tele-glaucoma, as compared to traditional assessment: 78 ± 20 minutes, n= 39, range 40 - 130mins vs. 115 ± 44 minutes, n=39, range 51-216 minutes, $p<0.001$. The mean percentage time spent in waiting room was also significantly reduced for patients seen through tele-glaucoma vs. in person assessments: 19 ± 13% versus 41± 24%, n=39, $p<0.01$.

Discussion: Through tele-glaucoma, access to care is improved as the physician can grade the consultation on line at their convenience. When the patient arrives at the hospital to undergo an interview and testing, the system is more efficient as patients are spending less time waiting for a physician. A separate study is underway to validate the teleglaucoma exam and compare it to an in person examination for the same patient.

Conclusions: Tele-glaucoma improves access to care and is a more efficient way of managing glaucoma suspects and patients with early stage glaucoma as compared to traditional in-person assessment.

References

1. Kassam F, Amin S, Sogbesan E, Damji KF. The use of teleglaucoma at the University of Alberta. Journal of telemedicine and telecare. Sep 12 2012.
2. Alberta AIM: Access Improvement Measures. http://www.albertaaim.ca/. Accessed June 20, 2011
3. Institute for Healthcare Improvement. Office Visit Cycle Time. http://www.ihi.org/IHI/Topics/OfficePractices/Access/Measures/ThirdNextAvailableAppointment.htm. Accessed July 25, 2012.

103. A Comparison between Subconjunctival Mitomycin C Injection and Topical Application of Mitomycin C-soaked Sponges Used in Glaucoma Filtration Surgery

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Purpose: To compare the effect of subconjunctival mitomycin injection versus topical scleral application of mitomycin-soaked sponges on the postoperative status of glaucoma filtering procedures.

Methods: We reviewed the records of 33 patients who had a filtering procedure (trabeculectomy or EX-PRESS implantation under a scleral flap) during the year of 2012 and followed their post-operative status over three months. Patients were grouped into one of two categories based on how they received their mitomycin-C intraoperatively: 1) Subconjunctival injection of 0.2ml of 0.2mg/ml solution (0.04 mg) (SC); 2) Topical application of two sponges soaked in 0.4mg/ml solution on sclera (SP) for 3 minutes. Outcome measures were: 1) the need for subconjunctival 5-fluorouracil (5-FU) injections during the three-month postoperative period; 2) intraocular pressure (IOP) at the first, second, and third post-operative months; 3) change in number of glaucoma medications post-procedure; 4) intraoperative surgical time.

Results: Thirty-three subjects (17 in the SP group and 16 in the SC group) were compared over the three month time period. Nine of the 17 subjects (52.9%) in the SP group required additional 5-FU injections during the postoperative course versus two of the 16 subjects (12.5%) in the SC group (p-value 0.006). The average pre-operative IOP was 23.2 and 22.1 in the SP and SC groups, respectively (p-value 0.74). Intraocular pressures (IOP) were 10.8 mmHg and 9.1 mmHg at post-operative month (POM) #1, 9.8 and 11.5 at POM #2, and 11.0 and 8.8 at POM #3 in the SP and SC groups, respectively (p-values 0.5, 0.4, and 0.4). The average number of medications changed from -3.4 in the SP group and -3.6 in the SC group (p-value 0.6). The mean surgical time of the SP and SC groups was 64 and 60 minutes, respectively (p-value 0.2).

Discussion: This study illustrates that subconjunctival injection of mitomycin may help reduce the number of post-operative 5-FU injections versus topical scleral application in the three month post-operative period for filtering procedures.

Conclusions: Injecting subconjunctival mitomycin intraoperatively may help reduce the need for additional costly antimetabolites in the postoperative period and their related complications to ocular surface integrity.

References

Broadway DC, Bloom PA, Bunce C, Thiagarajan M, Khaw PT. Needle revision of failing and failed trabeculectomy blebs with adjunctive 5-fluorouracil. Ophthalmology 2004;111:665-673.

Hawkins AS, Flanagan JK, and Brown SV. Predictors for success of needle revision of failing filtration blebs. Ophthalmology 2002;109:781-5.

Rotchford AP and King AJ. Needling revision of trabeculectomies: bleb morphology and long-term survival. Ophthalmology 2008;115:1148-53.

Singh K, Mehta Kala, Shaikh NM, Tsai JC, Moster MR, Budenz DL, Greenfield DS, Chen PP, Cohen JS, Baerveldt GS, Shaikh S. Trabeculectomy with intraoperative mitomycin C versus 5-fluorouracil. Ophthalmology 2000;107:2305-2309.

104. Clinical Applicability of the Glaucoma Staging Codes to Predict Disease Severity in Patients with Open Angle Glaucoma

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Purpose: To determine how the Glaucoma Staging Codes relate to visual field global indices, average retinal nerve fiber layer thickness, and clinically determined disease severity in patients with primary open angle glaucoma.

Methods: Over a six-week period, the charts of consecutive patients were prospectively reviewed. Included patients had optic nerve head damage consistent with glaucoma as well as reliable functional and imaging tests. Included patients also were required to have had standard automated perimetry (SAP) within one year of clinical examination and optical coherence tomography (OCT) within one year of the SAP. Patients were divided into early, moderate, and severe-stage glaucoma using the Glaucoma Staging Code guidelines. Target IOP also was used as a basis for defining clinical disease severity. Relationships between mean deviation, pattern standard deviation, average retinal nerve fiber layer thickness, clinically defined disease, and the staging system were evaluated.

Results: 616 patient charts were evaluated and 270 patients met the inclusion criteria. Of the 270 patients, both eyes were evaluated and the worse eye (by SAP mean deviation) was included in the analysis. Continuous variables were compared between the groups using 1-way analysis of variance (ANOVA) with Tukey Honestly Significant Difference (HSD) test for post hoc analysis. Using the Glaucoma Staging Code guidelines as a basis for defining severity, mean deviation was significantly lower in the severe-stage group compared with the moderate-stage group ($P<0.01$) and in the moderate-stage group when compared with the early-stage group. ($P=0.020$) Pattern standard deviation was significantly higher in the severe-stage group compared with the moderate-stage group ($P<0.01$) and in the moderate-stage group compared with the early-stage group ($P<0.01$). Average RNFL thickness values were not significantly lower in the severe-stage group compared with the moderate-stage group ($P=0.05$); however, it was significantly lower in the severe and moderate-stage groups compared with the early-stage group ($P<0.01$). When comparing severity groups defined by the Glaucoma Staging Code guidelines with those defined by target IOP, the two distinctly defined glaucoma severity groups were significantly different in categorizing eyes into early-stage, moderate-stage or severe-stage glaucoma (Pearson Chi-square test) ($P<0.01$).

Discussion: Glaucoma Staging Codes showed a statistically significant relationship to worsening MD and PSD with increasing severity of disease. Average retinal nerve fiber layer thickness was significantly lower in the severe and moderate-stage glaucoma groups compared with the early-stage group. Clinically defined disease severity and the coding system describe disease severity differently.

Conclusions: In patients with primary open angle glaucoma, the system investigated did not show a relationship to physician assigned disease severity.

105. Quality of Referral Letters to a Tertiary Glaucoma Unit- Adherence to the Glaucoma Guidelines

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Purpose: To assess the quality of glaucoma referral letters in relation to current guidelines.

Methods: Prospective review of 100 consecutive referral letters to a tertiary glaucoma unit. Letters were assessed for content in relation to the Canadian Ophthalmological Society glaucoma guidelines[1], legibility and if patient care was affected by poor referrals.

Results: Out of the 100 referrals, 40 came from optometrists, 45 from ophthalmologists and 12 from family physicians. The most common reason for referral was for suspected diagnosis of glaucoma (42%), assessment for progression/further treatment (22%), angle closure assessment (17%), second opinion (6%) and secondary uncontrolled intraocular pressure (IOP) (3%). Of the 42 referrals for suspected diagnosis of glaucoma, 15 were from optometrists and 19 from ophthalmologists. The 15 optometry referrals all provided IOP, visual acuity (VA) and disc assessment, 8 (53%) also provided visual fields (VF). In contrast, the 19 referrals from ophthalmologists provided much less frequent information on IOP (68%, $p=0.02$), VA (53% $p=0.002$), disc assessment (89%, $p=0.49$) and VF (5%, $p=0.004$). Of the 22 referrals for progression assessment or for consideration of surgery, 20 (90%) included the current IOP, 13 (59%) disc assessment, 17 (77%) current glaucoma therapy, 8 (36%) included a current VF and 4 (18%) provided previous VFs. Only 3 (14%) of these referrals included more than 10 of the 14 suggested information points in the Canadian Ophthalmological Society glaucoma guidelines, and 54% included less than 8 of the 14 points. Overall, 88% of the referral letters were deemed legible.

Discussion: Referral letters for a glaucoma assessment should include a minimum amount of information especially if treatment has been commenced or if the glaucoma has been monitored for long periods. Previous visual fields and pre-treatment IOP can be invaluable in management planning and progression analysis. Our study shows that glaucoma referral letters rarely contain all the relevant information and ophthalmologists are particularly at fault. The Canadian glaucoma guidelines suggest a proforma that may encourage this information to be included in referral letters.

Conclusions: 54% of glaucoma referrals from optometrists and ophthalmologists contain half or less of the suggest information recommended by the Canadian Ophthalmological Society. Over 20% of the referrals were at least partially illegible. Further education and perhaps implementation of a proforma may improve referral letter quality.

Reference

1. Rafuse PE, Buys YM, Damji KF et al. Canadian Ophthalmological Society evidence-based clinical practice guidelines. CJO 2009;44(1):S7-S93.

106. Impact of Generic Medications on the Cash Cost of Anti-glaucoma Medications

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Purpose: Over the last several years a large number of medications used to treat glaucoma have gone off patent and generic versions of these agents have become available. We were interested to learn how this would affect the cost of buying glaucoma medications for patients who do not have a drug plan.

Methods: Two branches of national drug store chains, one pharmacy in a "big box" national store, and a hospital pharmacy were asked to provide information about what they charge for various brand name and generic medications. All did so.

Results: Generic latanoprost costs slightly more than 1/2 to 2/3s as much as Xalatan, Travatan, and Lumigan (whose price varied about $10 among them). Generic brimonidine 0.2% costs about 2/3s less than Alphagan P, but brimonidine 0.15% was only slightly cheaper than Alphagan P and was more than twice as expensive as the 0.2%. Generic dorzolamide costs 1/2 to 2/3s less than Azopt, but the savings with the dorzolamide/timolol combination was less. The prices for all of these medications varied considerably between the different pharmacies and no one pharmacy was the cheapest for all medications.

Conclusions: The availability of generic glaucoma medications has reduced the cost of medical glaucoma therapy for patients buying these agents themselves, but the impact varies depending on the agent, with the least benefit for the prostaglandin class. Prices vary considerably between pharmacies and one can lower cost by comparison shopping.

107. Effect of Glaucoma Educational Videos on a Glaucoma Patient's Knowledge Regarding Glaucoma and Glaucoma Treatments

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Purpose: To evaluate patient's baseline knowledge of glaucoma and the impact of a series of educational videos on that knowledge

Methods: Patients newly diagnosed with glaucoma or as glaucoma suspects were given a 5 question multiple choice pre-test to evaluate their baseline knowledge of glaucoma. Patients were then shown a series of educational videos from Eye Imaginations Inc. The videos were less than 3 minutes in length each and talked about: the definition of glaucoma, causes and risk factors for glaucoma, and treatment options for glaucoma. Patients were then given the same test as a post-test immediately after viewing the videos.

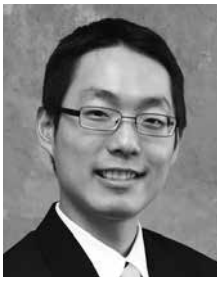
Main Outcome Measures: Patient's baseline knowledge about glaucoma and glaucoma treatment, impact of educational video in improving knowledge, possible barriers to adherence to therapy.

Results: Results from 30 survey respondents showed that only 50% of them identified glaucoma as a disease that can cause blindness prior to viewing the video. This increased to 70% after viewing the videos. Overall there was a statistically significant increase in the number of correct answers to the test after viewing the videos. 30% cited cost as a possible deterrent to taking eye drops while 40% cited worries about possible side effects of drops.

Discussion: Glaucoma is a silent disease and is one of the leading causes of blindness in the United States. Studies have shown high rates of non-compliance with glaucoma treatments which might be due to patient's poor understanding of the disease. This study evaluated the ability of short series of videos to effectively educate patients about glaucoma. An educational video is something simple that can be done while the patient is waiting to be seen by the doctor. This pilot study found a statistically significant increase in patient's knowledge about glaucoma after watching a series of educational videos. There needs to be larger scale studies to evaluate whether this increase in knowledge could possibly translate to an increase in compliance.

Conclusions: Educational efforts in the office in the form of short educational videos may improve patient's knowledge about glaucoma.

108. Methyl-Sulfonyl-Methane (MSM)-Induced Acute Angle Closure: A Case Report



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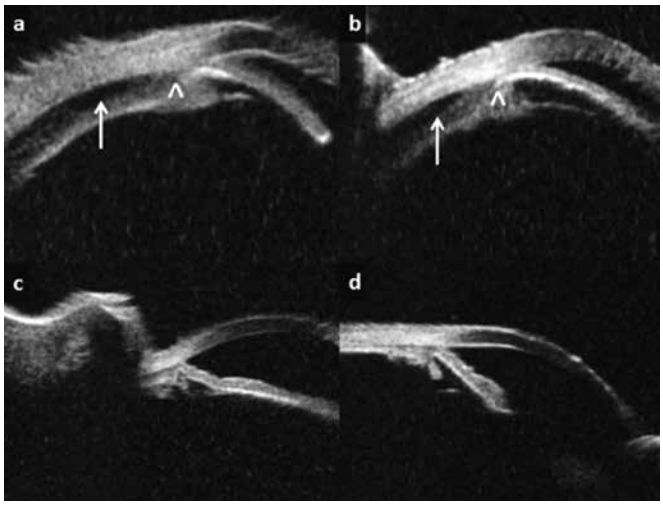
Purpose: Acute angle closure (AAC) has been associated with many medications. Sulfa-based drugs such as topiramate have been reported to cause AAC and uveal effusion. We report a case of bilateral AAC induced by a dietary supplement containing methyl-sulfonyl-methane (MSM).

Case Report: A 35-year-old woman presented to an outside ophthalmologist in bilateral acute angle closure, and was started on travaprost and pilocarpine and referred to Doheny Eye Institute. She had been taking prednisone, azathioprine, and hydroxychloroquine for the past year for lupus, and had started three new nutritional supplements one week prior to presentation. On initial exam, visual acuity was 20/400 OU, with bilateral closed angles on gonioscopy and a normal posterior pole. Ultrasound biomicroscopy (UBM, Figure ab) showed bilateral anterior rotation of the iris-lens diaphragm, ciliary body edema (arrowhead), and choroidal effusion (arrow). Sulfa-based drug-induced AAC was suspected given that one of the supplements contained the sulfa-containing compound MSM. Four days after stopping the supplement, her vision recovered to 20/20 OU. Repeat UBM (Figure cd) demonstrated bilateral open angles, deep anterior chambers, and resolution of choroidal effusion and ciliary body edema.

Discussion: Sulfa-based drugs have been reported to cause AAC, choroidal effusion and ciliary body edema. In our patient, the coincidence of bilateral acute angle closure with choroidal and ciliary body effusion that began one week after starting dietary supplements was suspicious for drug-induced AAC. The dietary supplement Basic Detox Nutrients contains MSM, the only constituent in the patient's medication list that contained a sulfonyl moiety. MSM is a widely-available supplement, and is believed to have anti-inflammatory and anti-oxidative properties. Given the similarity in chemical structure and clinical presentation, we postulate that MSM induces AAC in a manner similar to mechanisms previously described for other sulfa-based drugs.

Conclusions: As many prescription and non-prescription medications contain sulfonamide or sulfonyl moieties, it is important for ophthalmologists to be aware of their potential to cause AAC with uveal effusion. As MSM continues to be studied for its anti-inflammatory and anti-oxidative properties, investigators and marketers will need to be cognizant of its potential to cause AAC and provide proper warning to consumers.



109. The Association between Vitamin D Nutrient Density and Baseline Intraocular Pressure in the Age-Related Eye Disease Study (AREDS)

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Introduction: Evidence indicates topical serum 25-hydroxyvitamin D administration reduces intraocular pressure (IOP) in non-human primates. Serum 25-hydroxyvitamin D levels, the major biomarker of short-term vitamin D nutritional status, are significantly lower in blacks and Mexican-Americans than whites, the same groups with increased glaucoma risk. Serum 25-hydroxyvitamin D levels are frequently assessed through food frequency questionnaires (FFQ), but FFQ inadequately capture sunlight exposures representing substantial endogenous vitamin D sources.

Methods: The dbGaP Age-Related Eye Disease Study (AREDS) dataset, a longitudinal randomized clinical trial of high-dose antioxidants in age-related macular degeneration and cataract prevention with glaucoma as an exclusion criterion, was used in analysis. Analysis was restricted to whites to minimize confounding due to skin melanin concentration, and included only right eyes. General linear models (SAS, v9.3 Cary, NC) were used to assess linear relationships between Vitamin D Nutrient Density, calculated as a ratio of vitamin to total energy intake from FFQ data, and initial IOP, controlling for sex, age at enrollment, Centrum use, and self-reported baseline diabetes and hypertension. Two final models are compared; those with: 1) exclusion of subjects who self-report glaucoma; and, 2) adjustment for self-reported glaucoma status (yes, no, suspect).

Results: Among 3017 analyzed subjects, 1680 (55.7%) were female and mean age was 69.2 ± 5.0 yrs. Although Vitamin D Nutrient Density was not significantly related to IOP when subjects self-reporting glaucoma were excluded ($p = 0.204$), it was significant when self-reported glaucoma was included in adjusted analysis ($p = 0.039$).

Discussion: Results represent initial epidemiologic evidence of the relationship between Vitamin D Nutrient Density and IOP, an important glaucoma risk and prognostic factor. The statistically significant association among subjects who subsequently self-report glaucoma suggests a relationship may exist in those predisposed to developing glaucoma.

Conclusions: Further research with more at-risk ethnic/racial populations and serum 25-hydroxyvitamin D levels is warranted.

References

1. Kutuzova GD, Gabelt BT, et al. 1alpha,25-Dihydroxyvitamin D(3) and its analog, 2-methylene-19-nor-(20S)-1alpha,25-dihydroxyvitamin D(3) (2MD), suppress intraocular pressure in non-human primates. Arch Biochem Biophys. Feb 1 2012;518(1):53-60.
2. Pfeiffer CM, Schleicher RL, et al. Assessing vitamin status in large population surveys by measuring biomarkers and dietary intake - two case studies: folate and vitamin D. Food Nutr Res. 2012;56.
3. Gutierrez OM, Farwell WR, et al. Racial differences in the relationship between vitamin D, bone mineral density, and parathyroid hormone in the National Health and Nutrition Examination Survey. Osteoporos Int. Jun 2011;22(6):1745-1753.

110. An Evaluation of Non-Physician Educators in Enhancing Patient's Surgical Knowledge and Satisfaction

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Purpose: To evaluate the effectiveness of the pre-surgical patient counseling system at the Aravind Eye Hospital in Madurai, India. Counselors are non-physician educators trained in counseling strategies and ophthalmology.

Methods: 60 patients newly diagnosed with visually significant cataracts with no other ocular diseases were administered a questionnaire before and after they underwent cataract counseling. The questionnaire measured cataract knowledge and decisional conflict over whether to undergo surgery before and after counseling. The pre-counseling questionnaire measured socio-demographic characteristics including age, sex, occupation, literacy status, education, insurance status, and whether the patient was the primary decision maker. The post-counseling questionnaire measured patient satisfaction overall with the counseling services. The counselors were also given a questionnaire to test their knowledge, and their years of experience were recorded.

Results: Both patient knowledge scores and decisional conflict scores significantly improved following counseling (mean difference +2.0, $p=0.004$ and +8.4, $p<0.0001$, respectively). Multiple regression identified female sex, being illiterate, and being the primary decision maker as important factors in how much the counseling increased patient knowledge ($\beta=2.5$, $p<0.001$ for sex, $\beta=1.7$, $p=0.04$ for literacy and $\beta=-1.5$, $p=0.06$). 99% of patients reported that they were satisfied with the counseling system, and counselor knowledge score was significantly correlated to the patient satisfaction score (Pearson correlation coefficient 0.49, $p<0.001$). There was also a significant correlation between the patient satisfaction score and the change in patient knowledge score (Pearson correlation coefficient 0.28, $p=0.03$).

Discussion: Training non-physician educators to counsel patients about cataract surgery is effective in improving patients' knowledge about their condition, and in reducing their anxiety about making the decision to go through with the surgery. Counseling is very important in reaching out to patients who have traditionally had more limited access to healthcare such as women, illiterate patients and patients who are not their own primary decision maker.

Conclusions: Using ophthalmic counselors to educate patients about eye disease is an important part of improving patient knowledge and satisfaction at Aravind. Similar counseling, if well performed, could be used to educate patients about glaucoma, the importance of glaucoma follow up, adherence to therapy, and glaucoma surgery.

111. Glaucoma in Stevens-Johnson Syndrome

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Purpose: To report the long-term evolution, final visual acuity (VA) and intraocular pressure (IOP) of patients with Stevens-Johnson syndrome (SJS).

Methods: This is a retrospective case series of SJS. Patients with SJS from one single academic institution and at least 5 years of follow-up were included. Characteristics, medical and surgical treatments, final IOP and VA are reported.

Results: Seven patients diagnosed with SJS (age at diagnosis 20.86 years old, range 6-50 years) were followed for an average of 23.57 years, range 6-54 years. Two of the patients were females and 5 were males. Two cases were caused by reaction to sulfamide, 2 to penicillin, 1 to phenobarbital, 1 to ibuprofen and 1 to nevirapine. Six patients needed corneal transplant, 3 of those requiring multiple transplants. The maximum IOP was 41.8 mmHg (range 22-44 mmHg). All 7 patients required multiple topical antiglaucoma medications during follow-up. Three patients had glaucoma surgical procedures (one patient had 2 Baerveldt shunts in the same eye, one patient had 1 Ahmed shunt and another had 90 degrees of transcleral cyclophotocoagulation). One developed blind painful eye secondary to corneal melt and perforation and underwent bilateral enucleation. Final mean IOP was 16.5 mmHg (range 9-34 mmHg). VA at the end of follow-up was hand movements or worse in 5 of the 14 eyes and VA equal or worse than 20/400 in 12 of the 14 eyes. Four of the 7 patients were on at least 2 glaucoma drops at the end of follow-up.

Discussion: All the patients in our series developed glaucoma with high IOP. The 3 patients that did not require glaucoma medications at the end of follow-up were the two patients that underwent Baerveldt and Ahmed placement and the patient that had bilateral enucleation. Glaucoma valve implants were effective in controlling intraocular pressures.

Conclusions: SJS is a devastating disease that represents a challenge for anterior segment and glaucoma specialists. Those patients may present with high IOP which can be controlled with medical therapy and surgical procedures.

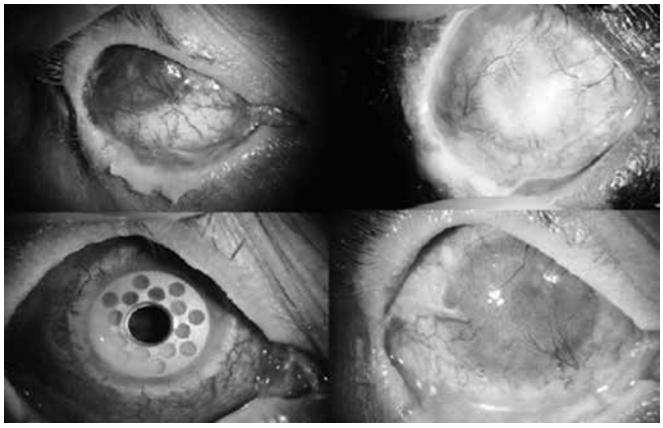

Table 1. Characteristics of patients with Stevens-Johnson syndrome.

Patient	Gender	Age onset	Agent	Follow up (years)	Glaucoma procedure	Corneal transplant	Final number glaucoma drops	Final IOP (OD, OS)	Final VA (OD, OS)
1	F	8	Sulfamide	36	Baerveldt x2 (OS)	6 (OS)	0	15, 14	10/200, LP
2	M	6	Sulfamide	54	CPC OS 90 degrees	1 (OS)	2	19,34	2/200, NLP
3	F	50	Ibuprofen	6	no	Kpro (OD)	3	N/A	20/200, 4/200
4	M	11	Penicillin	27	no	1 (OS)	3	15, 24	20/20, CF
5	M	25	Penicillin	19	Ahmed x1 (OS)	3 (OD), Kpro (OS)	0	16, 10	LP, 5/200
6	M	37	Nevirapine	10	no	3 (OD)	0	enucleation	enucleation
7	M	9	Phenobarbital	13	no	no	2	9, 9	20/400, HM

112. What Patients Know about Glaucoma: Identifying Gaps in Knowledge

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Purpose: To describe the knowledge level of glaucoma patients compared with the general ophthalmology population.

Methods: A sample of patients at a private glaucoma specialty practice in Petaluma, California, was asked to complete a questionnaire consisting of true or false questions to test participants' knowledge of glaucoma. Responses were analyzed with two-tailed t-tests for continuous variables and chi-squared tests for dichotomous variables.

Results: A total of 70 glaucoma patients and 16 general ophthalmology patients took the survey. The mean age was 72 years, and the majority of patients were white women with a college education. Glaucoma patients had significantly better knowledge about glaucoma compared with controls (mean score 13.9 vs 11.6; P = .04). Additionally, glaucoma patients who had a clinic visit every 6 months or more frequently had higher knowledge scores (mean 14.4 vs 11.6, P =.009), and glaucoma patients who had lower knowledge scores were more likely to miss their medications more than once a week (mean 10.8 vs 14.2, P = .04). Among glaucoma patients, only 53% thought eye drops could have systemic side effects, 23% believed that treatment for glaucoma was not lifelong and 33% thought that glaucoma will have symptoms that warn people their glaucoma is getting worse.

Discussion: Although this study demonstrated that glaucoma patients in general had more knowledge about glaucoma than controls, it also found that there are still significant misconceptions that exist.

Conclusions: In general, patients with glaucoma have more knowledge about the disease than the general ophthalmology population, but significant misconceptions still remain. Future studies should include a larger, more representative sample and assess whether knowledge interventions modify the association between poor knowledge and poor medication compliance.

113. Data Mining a Health System EMR: Is Glaucoma a Sick Eye in a Sick Body?

YAO LIU, James D. Brandt.

University of California Davis, Sacramento, CA

Purpose: (1) To utilize data-mining tools to directly analyze de-identified data from a large health system electronic medical record (EMR) system to provide "real-time" analysis of a patient population within a tertiary eye care center. (2) To determine whether there are medication use patterns or systemic disease associations unique to patients with glaucoma as compared to those with age-related cataract.

Methods: A cross-sectional study was performed to identify systemic disease associations in a de-identified cohort of patients with glaucoma diagnoses compared to those with age-related cataract (without glaucoma) using ICD-9 codes. Our initial queries focused on the use of systemic beta-blocker medications and/or contraindications to the use of topical beta-blockers.

Results: Within an EMR database of >40 million patient visits (updated daily), 10,836 unique individuals were identified as having a diagnosis of any form of glaucoma. Fifty-six percent of glaucoma patients were female; the median age (decade) was between 61-70 years (ranging from less than 18 to over 90 years). Of the 52% of patients who reported their race, 68% identified themselves as Caucasian, 15% as African-American, 13% as Asian, 2.7% as mixed racial background, and 2.0% as either Native American or Hawaiian/Pacific Islander. Twenty-three percent of patients with glaucoma had a systemic disease for which a beta-blocker was contraindicated, while an additional 18% percent of patients were currently prescribed an oral beta-blocker.

As a comparator cohort we identified 12,102 patients with age-related cataract (without glaucoma). There was no statistically-significant difference compared to the glaucoma patients with regards to gender, age or ethnicity. Twenty-nine percent of patients with age-related cataract (without glaucoma) had a systemic disease for which a beta-blocker was contraindicated, while an additional 21% of patients were currently prescribed an oral beta-blocker. There was no statistically-significant difference as compared to glaucoma patients.

Conclusions: Data-mining an EMR system can be used to provide "real-time" data analyses of a patient population using de-identified patient data. Our first queries revealed that up to 50% of eye patients (with glaucoma or age-related cataract) had contraindications to the use of beta blockers or were already on systemic beta blockers; there was no statistically significant difference between our two cohorts.

114. The Safety of Oral Carbonic Anhydrase Inhibitors in Patients with a History of Sulfa Allergy

ANNA L. SILVERMAN, George R. Reiss.
George R. Reiss MD, PC, Glendale, AZ, Scripps College, Claremont, CA

Purpose: Patients who report a history of allergic reaction to sulfa-based medications are often prevented from using oral CAI's for fear of a similar reaction. Although developments in topical agents have improved, the more potent oral CAI's are considerably more effective. The likelihood of allergic reactions to CAI's in patients who report sulfa allergy was evaluated and presented previously. This abstract describes additional patient data accumulated since that time.

Methods: To determine if a crossover allergic sensitivity exists for sulfa-medications and oral CAI's, patient charts from a single physician's practice were reviewed to find those reporting a sulfa allergy. Patients who met this criterion and were given CAI's were interviewed regarding their experience with CAI's and their history of allergic reactions to sulfonamides and other medications. A 95% confidence interval of proportions was calculated using R Version 2.15.1.

Results: There were 136 patients and the CAI's used were Acetazolamide and/or Methazolamide. (Table 1)

Table 1. CAI Frequency

CAI Used	Frequency	Percent
Acetazolamide	99	72.8
Methazolamide	21	15.4
Both	16	11.8
Total	136	100

Only 6 individuals experienced acute allergic reactions to CAI's. (Table 2) No allergic reactions required medical intervention other than the discontinuation of the CAI.

Table 2. Frequency of CAI Allergic Reaction

Allergic Response	N	Percent
No Reaction	130	95
Rash	5	3.6
Joint Problems	1	0.7
Facial Edema	1	0.7
Total	137	100

Approximately 5% of sulfa-allergic patients experienced minor reactivity while the large majority was able to benefit from the CAI's. We are 95% confident that between 2.7% and 6.2% of sulfa allergic patients have allergic reactions to CAI's.

Discussion: Studies on the effects of CAI agents often systematically exclude patients with a known sulfa allergy. Many clinicians withhold CAI's from sulfa-allergic patients and this practice continues to be taught in medical and nursing education. This study proposes that such a contraindication should be reconsidered.

Conclusions: The weak cross-reactivity between sulfa medications and oral CAI's suggests that adverse allergic reactions to CAI's in sulfa allergic patients are infrequent and that these agents could be considered in such patients.

Breakfast Roundtables

Trabeculectomy Re-Visited: Modern Tweaks to Reduce Complications

Simon K. Law, MD

Sushma Rai, MD

Summary

Trabeculectomy is an effective procedure in management of glaucoma. However, certain complications are debilitating. The purpose of this presentation is to discuss methods that can reduce the complications. We will provide an overview of different approaches of performing trabeculectomy, discuss risk factors of complications, and introduce methods to reduce the rate of complications and enhance success.

Minimally Invasive Glaucoma Surgery (MIGS) for My Patients?

Steven D. Vold, MD

Andy C. S. Crichton, MD, FRCS

Summary

The role of MIGS in the treatment of glaucoma has yet to be clearly defined. In this interactive session, new MIGS technologies and the potential evolution of the glaucoma treatment paradigm will be thoroughly discussed. Lively debate will be encouraged.

What To Do When a Tube is Not Enough

Donald L. Budenz, MD

Steven J. Gedde, MD

Summary

Glaucoma drainage implant tubes are generally considered the "last resort" for glaucoma surgeons. But there is a definite failure rate immediateky after every tube implant and then a 5 - 10% probability of failure thereafter. Options once this happens are limited. We will discuss these options in the setting of a failed tube in terms of the risks and benefits of each.

Managing Glaucoma During Pregnancy

L. Jay Katz, MD

Carla J. Siegfried, MD

Summary

There are special concerns surrounding the use of glaucoma drugs during pregnancy and while breastfeeding. There are decisions that need to be made regarding which drugs will be used and when. Discussions with the patient regarding alternative therapy with lasers and surgery should be held to best determine the course of therapy on each individual basis. The severity of glaucoma stage may influence the recommendations.

Slit Lamp Procedures 101

Todd W. Perkins, MD

Jeffrey Zink, MD

Summary

This is an informal discussion setting to provide an opportunity to colleagues looking for guidance and advice on cases they may have, including tips for things like bleb needling, paracentesis, and venting ligated tube shunts.

Recognition and Treatment of Malignant Glaucoma

Harry A. Quigley, MD

Molly M. Walsh, MD

Summary

Present texts state that malignant glaucoma comes from aqueous misdirection. Misdirection cannot happen by the physics of the eye. Choroidal expansion explains the disease.

Management of Hypotony in Glaucoma

Sarwat Salim, MD

Summary

Hypotony after glaucoma filtration surgery is dreaded and unpredictable complication. The underlying etiology and management of this condition varies considerably depending on the post-operative stage at which it occurs. This session will be an open question and answer session with some didactic presentations where attendees will be able to ask clinically relevant questions and will get practical pearls to manage this condition more effectively.

Workshops

Coding, PQRS/E-Prescribing and Transitioning to ICD-10-CM

Summary

Are you proficient in coding for the services you provide? Did you receive a PQRS and E-Prescribing incentive payment? Do you know what's involved in transitioning to ICD-10-CM? From exams to tests to minor or major surgery, to addressing complications within the global period - this course will address a variety of coding challenges ranging from the day-to-day to complex cases to assure coding accuracy. Email your coding quandaries prior to the course to svicchrilli@aao.org.

Moderators:

Sue Vicchrilli

Cynthia Mattox, MD

Ron L. Fellman, MD

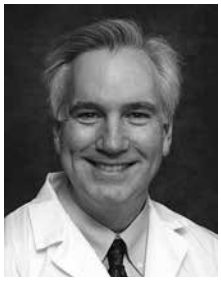
Superbowl of Grand Rounds

Summary

The Super Bowl of Grand Rounds is an inclusive, interactive session where attendees present and discuss challenging glaucoma cases. Over the course of the morning, we cover a remarkable amount of content, learning from each other as we discuss the cases, the pertinent literature and our clinical experiences. Five to eight cases are typically presented, and all attendees, including provisional members, are encouraged to submit a case for possible inclusion in the grand rounds. All are invited to attend and participate in the lively discussion.

Moderators:

Jody Piltz-Seymour, MD



Dale K. Heuer, MD

Special Interest Group

The EHR: Special Needs for Glaucoma

Summary

The focus of this SIG will be to bring together a group of glaucoma specialists who have an interest in caring for glaucoma patients using the EPIC electronic medical record (EMR). The panelists will each present how they have currently implemented EPIC in their practice, including implementations of EPIC that have been successful and aspects of EPIC functionality that could be improved, with a specific focus on glaucoma care. The group will discuss potential recommendations and best practices that the American Glaucoma Society might present to EPIC for implementation to ensure that future EPIC software releases allow the ophthalmologist to appropriately care for glaucoma patients.

Nathan M. Radcliffe, MD

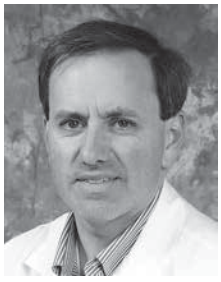
James D. Brandt, MD

Steven L. Mansberger, MD, MPH

Michele C. Lim, MD

Jonathan S. Myers, MD

Joseph L. Sokol, MD



John C. Burchfield, MD

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WASHINGTON D.C. 2014
Feb 27–Mar 2 • Omni Shoreham

Join us for a top-notch, innovative scientific program, networking and fun!

The American Glaucoma Society's 24th Annual Meeting will be held in our nation's capitol, Washington, D.C. Featuring an advocacy day, cutting edge surgical symposium, breakthrough surgical videos symposium, interactive sessions on current and hot topics, intimate breakfast roundtable sessions, special interest group sessions, multiple poster sessions, and continuing education credits (CME). The meeting will start early at 7am on Thursday, Feb 27th and it will be a full day!

American Glaucoma Society | T: (415) 561-8587 | E: ags@aao.org | www.americanglaucomasociety.net

Index

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