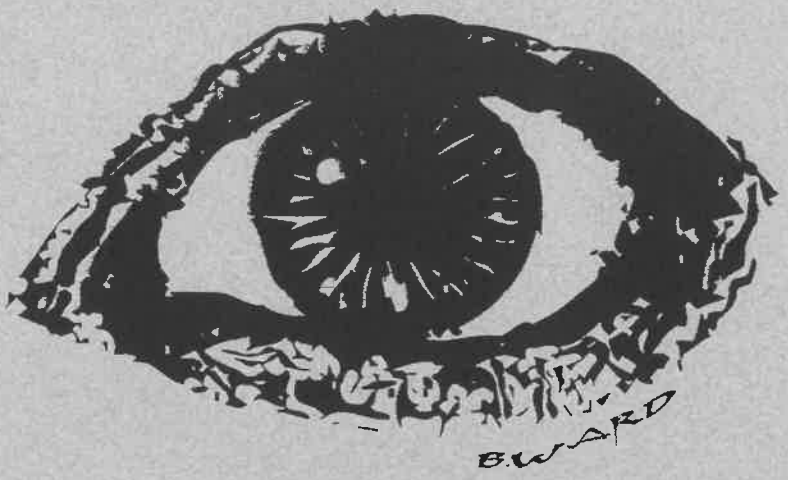


RESIDENT/FELLOW RESEARCH DAY

June 5, 2004

DEPARTMENT OF OPHTHALMOLOGY AND VISUAL SCIENCES

UNIVERSITY OF IOWA
ROY J. AND LUCILLE A. CARVER COLLEGE OF MEDICINE

UNIVERSITY OF IOWA HOSPITALS & CLINICS

IOWA CITY, IOWA

Braley Auditorium
01136 Lower Level
Pomerantz Family Pavilion
8:00 AM – 1:30 PM

RESIDENT/FELLOW RESEARCH DAY - 2004

DEPARTMENT OF OPHTHALMOLOGY

PROFESSOR AND HEAD

Thomas A. Weingeist, Ph.D., M.D.

PROFESSORS EMERITUS

Sohan S. Hayreh, M.D., Ph.D., D.Sc.
G. Frank Judisch, M.D.
Hansjoerg E. Kolder, M.D., Ph.D.
Karl C. Ossoinig, M.D.
Edward S. Perkins, M.D., Ph.D.
William E. Scott, M.D.
H. Stanley Thompson, M.D.

ASSOCIATE EMERITUS

E. Lee Allen

PROFESSORS

Wallace L. M. Alward, M.D.
Keith D. Carter, M.D.
Thomas L. Casavant, Ph.D.
James C. Folk, M.D.
Gregory S. Hageman, Ph.D.
Ronald V. Keech, M.D.
Jeffrey A. Nerad, M.D.
Edwin M. Stone, M.D., Ph.D.
John E. Sutphin, Jr., M.D.
Michael Wall, M.D.

ASSOCIATE PROFESSORS

H. Culver Boldt, M.D.
Karen M. Gehrs, M.D.
Kenneth M. Goins, M.D.
A. Tim Johnson, M.D., Ph.D.
Randy H. Kardon, M.D., Ph.D.
Young H. Kwon, M.D., Ph.D.
Andrew G. Lee, M.D.
Thomas A. Oetting, M.D.
Richard J. Olson, M.D.
Stephen R. Russell, M.D.
Mark E. Wilkinson, O.D.

ASSISTANT PROFESSORS

Hilary A. Beaver, M.D.
Terry A. Braun, Ph.D.
Sara L. Butterworth, O.D.
Brian R. Kirschling, O.D.
Robert F. Mullins, Ph.D.
Todd E. Scheetz, Ph.D.
Christine W. Sindt, O.D.
Nasreen A. Syed, M.D.

ASSOCIATE

Emily C. Greenlee, M.D.

ORTHOPTISTS

Pam J. Kutschke, C.O.
Wanda L. Pfeifer, OC(C), C.O.M.T.

ASSISTANT TO THE CHAIR

Larry W. McGranahan, C.H.E.

MANAGER, RESEARCH AND DEVELOPMENT

Paul R. Montague, C.R.A.

FACULTY RESEARCH ADVISOR

Randy H. Kardon, M.D., Ph.D.

RESIDENT/FELLOW RESEARCH DAY - 2004

FELLOWS

CORNEA
Paul K. Row, M.D.

GLAUCOMA
Edward Sung, M.D.

NEURO-OPHTHALMOLOGY
Sonalee Kulkarni, M.D.

OCULOPLASTICS
Alice Song, M.D.

PEDIATRIC OPHTHALMOLOGY
Glen Bianchi M.D.
Michael Hunt, M.D.

RESEARCH
Michael Abramoff, M.D., Ph.D .
Hakan Durukan, M.D.
Michael Grassi, M.D.

VITREORETINAL DISEASE
Esther Bowie, M.D.
Jason Sanders, M.D.
Matthew Wood, M.D.
David S. Zumbro, M.D.

RESIDENT/FELLOW RESEARCH DAY - 2004

THIRD-YEAR RESIDENTS

William J. Dupps, M.D., Ph.D.
John F. Fingert, M.D., Ph.D.
Erin L. Holloman, M.D.
Jennifer J. Lee, M.D.
Judy C. Liu, M.D.

SECOND-YEAR RESIDENTS

Michael V. Boland, M.D., Ph.D.
Andrew P. Doan, M.D., Ph.D.
Lynn Fraterrigo, M.D.
James G. Howard, M.D.
Sudeep Pramanik, M.D.

FIRST-YEAR RESIDENTS

James M. Coombs, M.D.
Reid Longmuir, M.D.
Jeffrey Maassen, M.D.
Erin O'Malley, M.D.
Erin Shriver, M.D.

ORTHOPTIC STUDENTS

Sara Downes, B.S.
Rebecca Parrish, B.A.

RESIDENT/FELLOW RESEARCH DAY - 2004

Research Day is supported in part by
The University of Iowa Department of Ophthalmology & Visual Science
Residents and Fellows Research Fund,
Research to Prevent Blindness,
Alcon Pharmaceuticals.

RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Saturday, June 5, 2004

10:30 **BREAK**

RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Saturday, June 5, 2004

RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Saturday, June 5, 2004

Presenting at Morning Rounds

Wednesday, June 2, 2004

Manuscripts Submitted

Assessment of Improvement in Visual Acuity During Amblyopia Treatment Using The Iowa Filter Bar

Michael G Hunt, M.D.
Richard J. Olson, M.D., Ronald V. Keech, M.D., sponsors

Background: The assessment of visual acuity changes in very young children undergoing treatment for amblyopia is problematic. While preferential looking techniques and VEP play a role, the most common clinical method for assessment is fixation preference with or without a prism to induce a tropia. Previous studies have developed techniques to enhance the fixation preference test, but these are not commercially available and can be expensive to fabricate. In phase 1 of our study a pilot study with an inexpensive, easy-to-make filter bar with Fresnel prisms and a graded set of Bangerter foils (Iowa filter bar) was shown to progressively degrade visual acuity in adults.

Purpose: To determine if the Iowa filter bar can reliably track improvement in visual acuity during amblyopia treatment (phase 2)

Methods: Optotype visual acuity and fixation preference using the Iowa filter bar were tested in amblyopic children 5 years of age or under who could perform optotype visual acuity testing. Children were followed for 3 visits or until vision was equal. Comparison between visual acuity and filter strength used to cause a switch in fixation to the amblyopic eye was made.

Results: The successive graded filters were shown to progressively degrade visual acuity in adults. Data is currently still being collected on phase 2 of the study.

Conclusion: Pending.

Relationship Between Optic Nerve Pallor and Retinal Nerve Fiber Layer Thinning

Sonalee Kulkarni M.D.
Andrew Lee MD, Michael Wall MD, and Randy Kardon MD PhD, sponsors

Purpose: to determine the incidence of optic nerve pallor in eyes with optic neuropathy undergoing retinal nerve fiber layer measurement by optical coherence tomography (OCT). This will be done to determine how often thinning of the retinal nerve fiber layer can occur without pallor and whether pallor can occur without significant loss of the retinal nerve fiber layer.

Methods: Eyes with different forms of optic neuropathy (ischemic, compressive, recovered optic neuritis, resolved pseudotumor cerebri, and congenital causes) were examined and the presence or absence of pallor was recorded. Pallor was also assessed from optic disc photography, when performed. In the same eyes, visual field testing and measurement of the retinal nerve fiber layer thickness was also performed. The incidence of pallor was computed as a function of the number of significantly thinned clock-hour sectors of the retinal nerve fiber layer analysis (OCT3), and the diagnostic category.

Results: Will be presented.

Ultra Long-Term Outcomes of Penetrating Keratoplasty for Keratoconus

Sudeep Pramanik, M.D., M.B.A.
Ayad Farjo, M.D. and John Sutphin, M.D., sponsors

Purpose: Keratoconus is a progressive, noninflammatory, bilateral degeneration of the central and paracentral corneal stroma that can lead to irregular myopic astigmatism. Penetrating keratoplasty is a well-accepted treatment for advanced keratoconus. Current studies have reported "long-term" graft survival data up to five years from the time of transplant. Also, scattered reports of late recurrence of keratoconus have been described, but the rate and predisposing factors are unclear.

Methods: We will review retrospectively the records of all patients with keratoconus who underwent penetrating keratoplasty at UIHC more than 20 years ago to determine the rate of ultra long-term graft survival. Secondary outcome measures would include visual acuity, rejection episodes, complications, recurrence of keratoconus, secondary procedures, and need for repeat corneal transplant.

Results: We collected data on 107 eyes of 81 patients with a mean followup of 173 months. Preliminary analysis indicates a recurrence rate for keratoconus of approximately 5% among our patients. Further analysis regarding risk factors for graft failure and disease recurrence will be presented in June.

Support: Supported in part by a grant from The University of Iowa Department of Ophthalmology Residents and Fellows Research Program.

Characterization of Wavefront Aberrations in Patients Who Underwent Deep Lamellar Endothelial Keratoplasty (DLEK)

James M. Coombs, M.D.
Kenneth Goins, M.D. and John Sutphin, M.D., sponsors

Background: The standard treatment for replacement of the failed corneal endothelium is a full thickness corneal transplant or penetrating keratoplasty (PKP). Post operative astigmatism and anisometropia can limit useful vision in these patients. Deep Lamellar Endothelial keratoplasty (DLEK) is a new procedure whereby a deep, 5.0 to 9.0 mm length, limbal incision is made, then a lamellar dissection is performed throughout the entire cornea, and the posterior one-third of the central corneal tissue thickness is replaced by a similar lenticule of donor tissue with a healthy endothelial layer. Early clinical results of this technique have demonstrated significantly less postoperative corneal astigmatism and faster visual rehabilitation for the patient as compared to the results after PKP. Despite the theoretical advantages of DLEK, only 44% of patients at one year after surgery have a visual acuity 20/40 or better, as compared to approximately 70% of patients after PKP.

Purpose: The purpose of this investigation is to characterize the wavefront aberrations in patients who undergo DLEK and to compare these findings with the wavefront aberrations present in PKP patients. In addition, we want to determine if higher order wavefront aberrations limit the final visual acuity in DLEK patients.

Methods: Preoperative examination of patients will involve a complete eye examination including measurements of uncorrected Snellen visual acuity (UCVA), best corrected Snellen visual acuity (BCVA), corneal topographic mapping (ORBSCAN II), and pachymetry of the central cornea. Postoperatively, the patients will have the same studies done at six, twelve, twenty four, and thirty-six months with the addition of endothelial cell counts of the central graft. Standard post-surgical followup will occur as well but data will only be gathered at these time points. Outcome measures will include: uncorrected Snellen visual acuity (UCVA), best corrected Snellen visual acuity (BCVA), total corneal astigmatism and posterior surface elevation by ORBSCAN corneal topography, refractive corneal astigmatism, total wavefront error, quantitation and characterization of higher order wavefront error, and endothelial cell counts. Comparison of postoperative measurements will be made with the patient's preoperative measurements, and these findings will be compared to current literature reports on PKP outcomes.

Results: Not yet available

Conclusions: Not yet available.

Web-Based, Parent-Directed Vision Screening for Amblyopia Detection in Children

Erin O'Malley, M.D.
Richard J. Olson, M.D., sponsor

Background: Amblyopia is the most common cause of decreased vision in childhood. It is characterized by poor vision in one or both eyes, which occurs secondary to inadequate visual stimulation during the period when the visual pathways are plastic. It is present in 2-4% of the general population and represents a potentially reversible cause of vision loss. The prognosis for reversing amblyopia, which can be caused by strabismus, anisometropia, or media opacity such as cataract, depends on the age of the patient at the time that amblyopia is recognized as well as the severity of amblyopia.

The American Academy of Pediatric Ophthalmology and Strabismus (AAPOS) and the American Academy of Pediatrics (AAP) guidelines state that vision screening should be performed by the pediatrician on the first day of life and during well-baby examinations by assessing the red reflex. The guidelines recommend that visual acuity first be assessed at 2.5 to 5 years of age using a chart of Snellen letters, tumbling E's or Allen optotypes. If vision less than 20/40 is detected or there is a difference of 2 lines or more, the AAP recommends that the patient be referred to an ophthalmologist for evaluation. An additional method in use for sceening young children for amblyopia is photo-screening. Also, some school-aged children have visual acuity screening performed when they enter school. However, this is variable around the United States. We propose that a free, web-based service that is available as a quick, straight-forward, vision screening tool for parents to test their 2-5 year olds, would add to the body of programs currently available to screen young children for amblyopia.

The web-based program developed by Dr. Rick Olson fulfills the purpose of being widely accesible, free and easy to use. It is adminstered by a parent, testing one eye at a time, using single optotypes with crowding bars to simulate line letters. The computer algorithm matches the patients answers with an overall score for each eye. This score (from 1 to 15) corresponds to visual acuity. Any decreased visual acuity or a difference between the two eyes prompts referral information for further evaluation by a pediatric ophthalmologist. Preliminary studies have demonstrated that 3-7 year old children can be successfully screened using the software. (Further results of preliminary testing will be presented by Dr. Glen Bianchi.) Another important role of the website is as a tool to provide free, accurate information educating parents regarding amblyopia and the importance of vision screening.

Methods: Parents of patients being seen in the Pediatric Ophthalmology Clinic will be invited to participate. Children between 2 and 7 years of age will have visual acuity testing performed by the parent using the web-based software in the clinic. These patients will also be screened using traditional methods (BVAT) in the clinic. We will assess the reliability of the results generated by the computer screening by comparing the visual acuity information from the web-based screening with the information from the BVAT screening. We also plan to implement more widespread use of the software by having parents screen their children in their homes using their own computers and the web-based program, and plan to compare the data collected in this part of the trial with the in-clinic testing.

Visual Outcomes and Complications of Resident and Fellow Refractive Surgery

P.K. Row, M.D.
K.M. Goins, M.D. and J.E. Sutphin, M.D., sponsors

Purpose: Excimer laser refractive surgery is rapidly becoming an important and necessary skill for the comprehensive ophthalmologist. However, currently only a few academic institutions incorporate this surgery into their curriculum because of several issues including cost, risks of complications and fear of poor visual outcomes. We wish to present data from our institution that show excellent visual outcomes as well as low complication rates by trainees.

Methods: This study is a retrospective chart review of all consecutive patients from inception on 11/16/01 to 11/22/03. All patients recieved a preoperative screening exam and were followed postoperatively at one hour, one day, one week, one month, 3 months, 6 months, and 12 months. Several data points were gathered including vision, complications, suction time, flap thickness and the change in wavefront aberrations.

Results: Results of 50 consecutive patients (93 eyes) were reviewed. The average number of cases per trainee was 8. Surface ablation (LASEK or PRK) was done in 26% of eyes and LASIK in 76%. Our preliminary data shows that 75% achieved uncorrected snellen visual acuity of 20/20 or better with 50% achieving 20/15 at one month follow up, 81% achieved 20/20 or better with 57% achieving 20/15 at 3 months follow up, 100% achieved 20/20 or better with 81% achieving 20/15 at 6 months follow up, and 100% achieved 20/20 or better with 50% achieving 20/15 at 12 months follow up. Fifteen percent of eyes experienced complications requiring intervention including DLK, infection, and flap associated complications.

Conclusions: This demonstrates the potential for excellent visual outcomes after refractive surgery by trainees. Although the overall rate of complications incurred is higher than that of experienced refractive surgeons, none resulted in loss of best spectacle corrected visual acuity.

Modified Levator Recession and Muellerectomy for Lid Retraction Secondary to Thyroid Ophthalmopathy

Erin Shriver, M.D.
Keith Carter, M.D., sponsor

Purpose: Eyelid retraction is the most common sign of thyroid ophthalmopathy. Lid retraction results when the horizontal tarsal ligamentous band and vertical eyelid retractors cannot lengthen to accommodate increasing exophthalmos. Upper eyelid retraction has been associated with a startled appearance, ocular discomfort, and keratopathy. Non-surgical treatments have been tried with minimal success. There is no clear agreement on the best surgical lengthening technique for upper eyelid retraction. One popular technique is the levator recession and muellerectomy. This surgery is often successful at restoring the natural lid length, however the upper lid crease is often sacrificed in the process. Dr. Keith Carter is currently performing a modified version of levator recession and muellerectomy aimed at lengthening the lid while preserving the upper lid crease. The purpose of this study is to assess if the modified levator recession and muellerectomy successfully restores the upper lid crease.

Methods: We will be assessing the prominence of the upper lid crease after modified levator advancement and muellerectomy. The extent of scleral show, palpebral fissure height, margin-reflex distance, and upper eyelid crease will be measured from photographs taken before and after the patient's surgery. The prominence of the upper lid crease will be scored in both pre and post-operative photos.

Results and Conclusions: Pending.

Validity of A Web-Based Vision Screening Tool

Glen M. Bianchi, M.D.
Richard J. Olson, M.D., sponsor

Introduction: Effective yet inexpensive methods of vision screening for the general pediatric population continue to be elusive. Multiple modalities ranging from volunteer optotype testing to photoscreening have been used with mixed success. The Internet, though ubiquitous in popular culture, is still a relatively untapped resource for vision screening. To be a valid vision screening tool, a web-based program must generate accurate results, without professional assistance, in a broad range of settings, with users of varying levels of computer skill.

Methods: We designed a web-based preschool vision screening tool through application of the "usability" model of computer programming. Children recruited from our clinic were first evaluated as part of a parent/child "team." In a room with a computer linked to the internet, and with no outside assistance, the parent and child performed the web-based test. Visual acuity was then measured in a masked fashion by the staff of the clinic using randomly generated, "surrounded HOTV" optotypes as a normal portion of their clinic visit.

Results: Visual acuity results using the web-based tool correlated well with acuities measured by health-care professionals using traditional methods.

Conclusions: Fewer than 25% of preschool children are currently screened for amblyopia in the United States. A free, accessible, usable and clinically validated screening tool may offer many advantages over current methodologies. Further validation in children's own homes, using their own computers, is ongoing.

Multifocal Visual Evoked Potentials (mfVEP) in Compressive Optic Neuropathy

Alice Song, M.D.
Keith Carter, M.D., Jeffrey Nerad, M.D., sponsors

Purpose: To evaluate the efficacy of the multifocal VEP (mfVEP) in evaluating local optic nerve damage in compressive optic neuropathy and to correlate the sensitivity of mfVEP with visual acuity (Va), SITA 24-2 Humphrey visual fields (HVF), relative afferent pupillary defect (RAPD), and critical flicker fusion (cff) frequency.

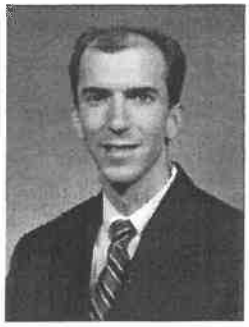
Methods: Prospective study of patients with compressive optic neuropathy based on subjective decreased Va, RAPD, decreased cff, or changes in visual fields. Evaluation of these parameters was performed prior to and after surgical intervention to alleviate the compression. Inclusion criteria included predominantly unilateral compressive optic neuropathy from Graves' ophthalmopathy, optic nerve lesions, orbital tumors, idiopathic intracranial hypertension. Exclusion criteria included previous intervention for the compressive optic neuropathy and history of optic nerve or retinal nerve fiber layer damage.

Results: Analysis of preoperative and postoperative measurements were performed on 4 patients, 3 with Graves' compressive optic neuropathy, and 1 with suprasellar and orbital meningioma. Information on mfVEP analysis included 1) signal of <90 nV, 2) amplitude deviation plot, 3) intereye asymmetry comparison. There was correlation with improvement in HVF and improvement in some mfVEP parameters in patients.

Conclusions: Our pilot study suggests some mfVEP results correlate with HVF changes in compressive optic neuropathy and may be more sensitive in detecting changes in visual field defects. A larger database is required to determine which parameters of the mfVEP may correlate more reliably with the severity of neuropathy.

Support: Supported in part by a grant from The University of Iowa Department of Ophthalmology Residents and Fellows Research Program.

Transmission Electron Microscopic Evaluation of a Post Mortem Globe Treated with Photodynamic Therapy for a Subfoveal Choroidal Neovascular Membrane Secondary to Age Related Macular Degeneration



Jason Sanders, M.D.
Greg Hageman, Ph.D., sponsor

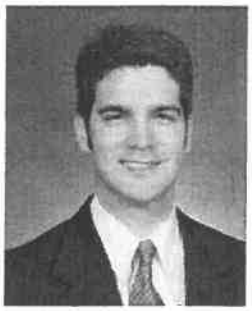
Methods: Post mortem evaluation of globes using a transmission electron microscope.

Results: The subject had a past ocular history of age related macular degeneration (ARMD). Her right eye had undergone focal laser photocoagulation for a juxtafoveal choroidal neovascular membrane (CNVM). The left eye recently had been treated with two sessions of Photodynamic Therapy (PDT) for a subfoveal CNVM. Both globes were harvested post mortem after a fatal myocardial infarction. Post therapeutic micro-structural analysis was performed using the Transmission Electron Microscope (TEM) of the left eye.

The TEM demonstrated the presence of a perfused CNVM in the subretinal space of the left eye. The neurosensory retina showed little disorganization, however, there was prominent disruption of the chorio-caprillaris (CC) and retinal pigmented epithelium (RPE).

Conclusions: PDT is a novel treatment for subfoveal CNVM secondary to ARMD. PDT has a theoretical benefit of concentrating its therapeutic efficacy on the pathologic CNVM while sparing the delicate neurosensory retina, RPE and CC. However, this evaluation of a globe treated with PDT and studied with TEM demonstrated continued perfusion of the CNVM as well as evidence of collateral damage to the CC and RPE.

Retrospective Analysis of Acanthamoeba Keratitis Diagnosed by Confocal Microscopy



Jeffrey L. Maassen, M.D.
Kenneth M. Goins, M.D., sponsor

Purpose: Confocal microscopy is a relatively new diagnostic modality in the field of ophthalmology. The confocal microscope utilizes a single point source of light to illuminate an object while this light is simultaneously detected by a point detector in phase with the source. This allows for resolution not only in the horizontal axis but the vertical axis as well. This property makes it ideal for imaging translucent tissues like the cornea. One area that the confocal microscope has excelled at is diagnosing Acanthamoeba keratitis. Acanthamoeba are a free-living parasites that are ubiquitous in our world, found in water (fresh water as well as tap water), air, and soil. Acanthamoeba can cause a serious keratitis and was previously difficult to diagnose without invasive testing. Additionally, Acanthamoeba is difficult to culture. Confocal microscopy has made it easier to non-invasively detect the dormant cysts or active trophozoites of Acanthamoeba infecting the cornea.

While confocal microscopy has previously been shown to be a sensitive way to diagnose Acanthamoeba keratitis, there are situations where the confocal microscope will apparently detect Acanthamoeba in the cornea, but the epithelial biopsy will be negative. This presents a dilemma because patients with Acanthamoeba keratitis often require long-term therapy.

Methods: We will retrospectively review consecutive cases of Acanthamoeba keratitis diagnosed by confocal microscopy over the past year. We will then correlate and compare these results with epithelial biopsies of these patients or from corneal button results following penetrating keratoplasty. The primary goal of this project will be to establish the diagnostic certainty of our confocal microscope compared to tissue diagnosis.

Imaging the Retinal Function Using the Intrinsic Optical Signal

Michael Abramoff, M.D., Ph.D., Daniel Ts'o, Ph.D., Peter Soliz, Ph.D.

Randy Kardon, M.D. Ph.D., Young H. Kwon, M.D. Ph.D., sponsors

Aim: To image neural activity related signals due to visual stimuli using intrinsic signal optical imaging, a technique whereby the changes in reflectance to light of a specific wavelength are measured, analyzed and mapped.

Methods: Anesthetized cats (n=3) and awake humans (n=4) were used as subjects. A custom built modified fundus camera illuminated (780nm) the retina and imaged the reflectance of the retina with a sensitive cooled CCD video camera, while the subject was looking at counterflickering checkerboards in the shape of vertical and horizontal bars (~5° arc) (550nm). Changes in reflectance were analyzed using principal component analysis and other image processing techniques, resulting in 'functional maps' and signal time courses.

Results: In anesthetized cats, functional maps show that measurable optical changes occur in the area of the retina that was stimulated visually. In awake humans, the signal is less clear spatially, but the temporal course of the signal corresponded to the stimulus profile.

Conclusions: Intrinsic signal optical imaging is feasible in the retina in anesthetized cats and in awake humans. Further development and refinement of the technique may allow high spatial-resolution, non-invasive functional imaging of the retina. If successful, this is expected to essential for a better diagnosis and treatment follow-up of potentially blinding retinal diseases, especially glaucoma and diabetic retinopathy.

Intravitreal Kenalog for Uveitis

David S. Zumbro, M.D.
James C. Folk, M.D., sponsor

Purpose: Intravitreal injection of triamcinolone acetonide has been used to treat a variety of ocular diseases and appears to be well tolerated. We reviewed our experience using intravitreal triamcinolone injections in patients with severe uveitis to determine the effectiveness of treatment, duration of effect and complications.

Methods: After local IRB approval, a list of University of Iowa patients with the CPT code for intraocular injection from January 1, 1998 to the present was created. All the patient records were reviewed to sort out those who received intravitreal Kenalog for severe noninfectious uveitis. These records were then evaluated for: diagnosis, dose and method of injection, therapeutic effect, duration of effect, complications, and need for surgery or repeat injection.

Results: We identified 10 patients with severe uveitis who received intraocular Kenalog. Diagnoses included: multifocal choroiditis with panuveitis (3), sympathetic ophthalmia (3), serpiginous choroiditis (2), sarcoidosis (1), and uveitic glaucoma (1). All patients received 4mg/0.1ml of commercially available Kenalog (triamcinolone acetonide 40mg/ml) through the pars plana under topical anesthesia. Topical povidone iodine solution was used in each case to reduce the risk of infection. Patients received from one to ten injections during follow-up for a total of 27 injections. Mean followup was 14 months and ranged from 1 to 35 months. Improved vision (> 2 lines) occurred in 3 patients. 5 patients remained stable and 2 patients had worsening vision (>2 lines). All patients had reduced inflammation. No patient developed endophthalmitis. One patient required a seton for uncontrolled steroid response glaucoma. There were no other IOP complications. All three patients with sympathetic ophthalmia and one patient with multifocal choroiditis required multiple injections (3-10). Duration of effect was variable and related to severity of inflammation at time of injection and presence of a trabeculectomy or seton.

Conclusions: Intravitreal triamcinolone injection is effective in decreasing inflammation and stabilizing vision in patients with severe uveitis. Multiple injections may be required.

Analysis of Emergent Versus Planned Retinal Detachment Repair Outcomes

Matthew Wood, M.D.
Karen Gehrs, M.D., sponsor

Purpose: To examine outcomes of retinal reattachment surgery.

Methods: A chart review of retinal detachment repairs, excluding pneumatic retinopexy, performed from July 1, 2000 to June 30, 2002 at the University of Iowa Hospitals and Clinics. Factors considered include, days to repair from presentation, time of procedure, presence or absence of an afferent papillary defect, visual acuity, presence of hypotony, presence of proliferative vitreoretinopathy, macular attachment status, total operating room time, 3 and 6 month postoperative visual acuity, complications, and additional procedures performed.

Results: Pending.

Conclusion: Study is ongoing.

Changes in the Basal Dimensions of Ocular Melanoma Following I-125 Brachytherapy

E.M. Bowie, M.D.
H.C. Boldt, M.D., sponsor

Objective: To assess the changes in the basal dimensions of choroidal melanoma following I-125 brachytherapy.

Design: Retrospective case series. The charts, photographs and fluorescein angiograms of 200 patients in the Collaborative Ocular Melanoma Study (COMS) were reviewed.

Participants: Two hundred patients, each of whom had posterior uveal melanoma treated with I-125 brachytherapy in the COMS study.

Main outcome measures: There were two main outcome measures: 1) changes in the basal dimension of the tumor at 6 months and 1 year, and 2) enucleation.

Results: Pending.

Duration of Maximum Cycloplegia in Children Using Cyclopentolate 1%

Sara Downes, B.S.
Ronald V. Keech, M.D., Wanda L. Pfeifer, OC(C), COMT, sponsors

Purpose: The purpose of this study is to determine the duration of maximum cycloplegia in children using the dilating agent cyclopentolate 1%. For this study, maximum cycloplegia is defined as a difference of no greater than 0.5 diopters of residual accommodation from peak refraction.

Methods: This is a prospective study of the duration of maximum cycloplegia in children ages 4-12. Cyclopentolate 1% will be the cycloplegic agent used. The Nikon Speedy K autorefractor will be used to obtain measurements of refractive error. Measurements will be taken before the drops are administered and every 10 minutes after for 60 minutes to determine residual accommodation. Iris color will be graded using the Seddon, et al. iris color classification system. Data will be graphically analyzed as time versus residual accommodation in gradation of iris color.

Conclusion: Pending conclusion of this study.

Phenotypic Characterization of Blue Cone Monochromacy with Loss of the Locus Control Region

Michael A. Grassi, M.D., Benjamin R. Roos
Edwin M. Stone, M.D., Ph.D., sponsor

Purpose: To describe the phenotype of blue cone monochromacy associated with a deletion in the locus control region.

Methods: Polymerase chain reaction was used to characterize the molecular structure of the red pigment gene, the green pigment gene, and the locus control region (LCR) upstream of the red gene in a family with blue cone monochromacy. Affected individuals were examined with the use of extensive color vision testing, funduscopy, dark adaptometry, perimetry, and electroretinography (ERG).

Results: Analysis revealed a 16kb deletion extending from the proximal 9kb portion of the LCR through exon 1 and intron 1 of the red pigment gene. The remaining exons of the red gene as well as all of the exons of the green gene were present. Affected individuals had an interesting constellation of findings including: myopia, bilateral macular atrophy, poor central color vision with preserved peripheral color appreciation, and an attenuated photopic ERG response.

Conclusion: We report the association between loss of the LCR in blue cone monochromacy and bilateral macular atrophy with absent central color vision and preserved peripheral color vision.

Evaluation of Potential Risk Factors and Predictors of Vision Loss in Patients with Optic Disc Drusen

Reid Longmuir, M.D.
Randy Kardon, M.D., Ph.D. (primary) and Andrew G. Lee, M.D., sponsors

Background: Optic disc drusen occurs in approximately 3 in1000 patients, although autopsy studies suggest higher. They are found in both eyes in up to 75% of patients. Optic disc drusen have been associated with visual field defects which are typically slowly progressive, asymptomatic, and difficult to predict simply by visualization of the optic nerve. Disc drusen have been associated with nerve fiber layer loss as documented by red-free photography, histopathologic evaluation, and more recently optical coherence tomography. Despite this finding, limited data exists evaluating the risk factors for developing field loss when drusen are present. Similarly, rate of progression of visual field loss and correlation of nerve fiber layer loss with visual function has not been studied in a large group.

Purpose: To search for potential risk factors for visual field loss in patients with drusen. Examples include disc area, number and size of drusen, nerve fiber layer thickness, intraocular pressure, axial eye length, and pattern evoke potentials from the ganglion cell layer. To determine rate of visual field loss and to correlate nerve fiber layer thickness with visual field sensitivity.

Methods: Once institutional approval is obtained, we will retrospectively analyze visual fields of patients with diagnosed optic disc drusen, and compare age to visual field loss. The prospective arm will involve recruiting approximately 50 patients, with whom we will perform kinetic and static perimetry, OCT of the optic nerve and nerve fiber layer, and pattern electroretinogram testing. We will also obtain intraocular pressure, axial eye length, and echography to determine size and number of drusen present. This data will be collected to search for risk factors associated with visual field loss and/or progression. Finally, we will correlate nerve fiber layer thickness with visual field loss by averaging all regions of the field together, as well as individual field locations (superior and inferior arcuate regions, nasal bundle, and maculopapillary bundle).

Changes in Nerve Fiber Layer Reflectivity using Optical Coherence Tomography in the Setting of Optic Neuropathy

M.V. Boland, M.D., Ph.D.
R.H. Kardon, M.D., Ph.D., sponsor

Purpose: It has been observed in some patients with severe visual field loss from glaucoma and other optic neuropathies that the optical coherence tomography (OCT) estimate of the retinal nerve fiber layer is thicker than expected. Patients with acute optic neuropathy have been followed over time and showed initial thinning of the retinal nerve fiber layer, followed by some degree of re-thickening. The purpose of this work is to determine whether there are features of retinal OCT that can be used to differentiate a healthy nerve fiber layer from the damaged and paradoxically thickened ones described above.

Methods: Four patients with various optic neuropathies and subsequent nerve fiber layer thinning and re-thickening on longitudinal OCT data were identified. All OCT data were collected using a Zeiss Humphrey OCT2 and each patient had at least 12 months of follow up. Scans of the retina adjacent to the optic nerve in both the healthy and diseased eye were processed using third party software (OCTPro 2k1) to identify the nerve fiber layer. The raw reflectivity data from the nerve fiber layer were then exported and analyzed using simple statistics (e.g., mean, standard deviation) and histograms.

Results: The mean reflectivity of acutely damaged nerve fiber layers decreased over time and then remained low even as the layer re-thickened. Histogram analysis of reflectivity data are consistent with a decrease in the average reflectivity and do not demonstrate a multi-modal distribution of reflectivity, at least for nerves with severe damage.

Conclusions: The reflectivity of the nerve fiber layer is an important feature that is not currently used in analysis of OCT data. Furthermore, thickness of the nerve fiber layer alone is not a perfect predictor of visual field loss. We hypothesize that one reason for this discrepancy is the re-thickening phenomenon mentioned above. We also believe that the re-thickened nerve fiber layer may contain gliotic tissue that has replaced damaged nerve fibers. The observed change in the reflectivity of the nerve fiber layer, even after re-thickening, is consistent with the presence of non-nerve tissue. Finally, given the changes we have observed in the reflectivity of the nerve fiber layer, it may be possible to distinguish normal from abnormal tissue and better correlate thickness with function.

Grant Identification: VA Merit Review Grant.
Supported in part by a grant from The University of Iowa Department of Ophthalmology Residents and Fellows Research Program.

Central Retinal Vein Occlusion Associated with Cilioretinal Artery Occlusion

Lynn Fraterrigo, M.D.
Sohan Hayreh, M.D., Ph.D., sponsor

Background: Central retinal vein occlusion (CRVO) may be associated with cilioretinal artery occlusion. In cases of non-ischemic CRVO, cilioretinal artery occlusion may be the primary cause of severe visual loss and presentation. Case reports/series describing this clinical entity are rare. No large systematic study has been performed which defines the clinical presentation, features, and prognosis of CRVO with cilioretinal artery occlusion.

Methods: We will perform a detailed review of the medical record of all patients with the diagnosis of CRVO with cilioretinal artery occlusion seen in the Ocular Vascular Clinic at the University of Iowa Hospitals and Clinics between 1974 and 2002. Demographic and clinical features of this disease entity will be recorded and analyzed. The frequency of presenting clinical symptoms and signs will be determined. The area of the retina affected by cilioretinal artery occlusion and its influence on the initial and final visual loss will be recorded. Its management, natural history and visual outcome will be evaluated. Collected data will be examined for prognostic value. Co-morbidities including systemic medications, systemic disease and tobacco use will be investigated. These data will be compared to available population controls.

Determination of the Diurnal Fluctuation of Intraocular Pressure in Glaucoma Suspects and Open-Angle Glaucoma Patients

Andrew Doan, M.D., Ph.D.
Young Kwon, M.D., Ph.D., Wallace Alward, M.D., Emily Greenlee, M.D., sponsors

Purpose: The one-eye drug trial for glaucoma medications reducing the intraocular pressure (IOP) is based on the fundamental belief that the response to a particular agent will be similar in both eyes. Also, the diurnal fluctuation of the IOP is assumed to be similar in both eyes. Thus, once a physician has demonstrated an IOP-lowering effect in one eye, then the medication is added to the second eye. If there is no effect with the medication in the one-eye trial, then the medication is abandoned. A recent paper (Realini et al., Ophthalmology, March 2004, Vol. 111, 421-426) challenges the utility of the one-eye drug trial for assessing efficacy of IOP-lowering medications in glaucoma management. The purpose of our study is to determine the diurnal variation of IOP in a population of patients that are: 1) glaucoma suspects; 2) normal tension or primary open angle glaucoma patients; 3) receiving one-eye treatment with an IOP-lowering medication; and, 4) receiving bilateral treatment with an IOP-lowering medication.

Methods: Proper IRB approval will be obtained. This study is a comprehensive, retrospective chart review of the glaucoma patients who have had an IOP diurnal curve measured at the University of Iowa, Hospital and Clinics, Department of Ophthalmology. Amongst the greater than 900 diurnal curves on record, the patient record will be selected for the study if there is no evidence of: unilateral glaucoma, unilateral surgery, or unilateral trauma. The patient records will then be placed into four categories: 1) glaucoma suspects; 2) normal tension or primary open angle glaucoma patients; 3) receiving one-eye treatment with an IOP-lowering medication; and, 4) receiving bilateral treatment with an IOP-lowering medication. The difference in the IOP between each set of eyes at each time point will be analyzed by linear regression to determine if there is concordance in the diurnal fluctuation between the eyes. Furthermore, analysis of the absolute value of the standard deviation of the diurnal curves will denote the degree of fluctuation encountered.

Results and Conclusion: Pending

Intraocular Pressure Elevation with Injection of Intravitreal Triamcinolone Acetonide

Edward Sung, M.D.
Wallace L. M. Alward, M.D., James C. Folk, M.D., Young H. Kwon, M.D., Ph.D., David S. Zumbro, M.D.

Aim: To investigate the effects of intravitreal injections of trimacinolone acetonide on intraocular pressure, and understand the risk factors contributing to the pressure elevation.

Methods: Retrospective review of consecutive patients who received intravitreal injections by the Retina Service at the University of Iowa Department of Ophthalmology for treatment of macular edema or choroidal neovascular membrane.

Background: Intravitreal triamcinolone acetonide has been increasingly employed as an effective therapy for a number of retinal diseases with neovascular, inflammatory, or edematous mechanisms.[1,2,3,4,5,6] Studies have been performed to document the prolonged presence of intravitreal triamcinolone in rabbit models or by indirect ophthalmoscopy in humans.[7,8] Recently, an article has demonstrated measurable quantities of steroid persisting in the eye for 93 days from a single injection by anterior chamber aqueous sampling.[8] A relevant study reported the effects of intravitreal steroids on intraocular pressure, by Jonas *et al.*[9] In his paper, where a substantially larger dose of steroid was injected (25mg vs 4mg) about 50% of eyes showed an increase in pressure, typically at one to two months' post-injection. Though the data were not stratified according to the amount of elevation in intraocular pressure, a mean maximum eye pressure of 23.38 mmHg was reported, with one subject reaching an IOP of 60 mmHg, requiring filtering surgery. The remainder of the data in the literature regarding glaucomatous side effects are reported in papers whose main thrust are toward the efficacy of the treatment, and the clinical and anatomical changes in the individuals studied.[1,2,3,10]

Goal: The goal of this study is to investigate and confirm the effect of intravitreal injection of triamcinolone acetonide on intraocular pressure, to quantify the percentage of subjects who have marked increases in IOP, and to report the clinical course of those who required medical and surgical intervention.

Results: A total of 36 charts were reviewed, with the first injection of steroid evaluated as the primary source of data for intraocular pressure changes. There were 18 male and 18 female subjects, with a mean age ± standard deviation of 61.4 ± 16.3 years. The mean pre-injection pressure was 16.7 ± 7.93 mmHg and mean peak pressure was 22.3 ± 10.1 mmHg. The average final intraocular pressure was 13.3 ± 4.28 mmHg. Seventeen subjects (47.2%) had pressure elevations ≤5 mmHg, eleven subjects (30.6%) saw elevations of 6 to 10 mmHg, two subjects (11.1%) elevated from 11 to 15mmHg, and six subjects (16.7%) had elevations > 15mmHg. The average time to elevation, for subjects whose intraocular pressure elevated > 5mmHg, was 54.5 ± 38.1 days. Five subjects

-Sung, continued from last page-

(13.9%) required medical intervention, while four (11.1%) required surgical intervention (trabeculectomy with mitomycin C in all four cases). The mean peak pressure of the treated subjects was 34.6 ± 8.56 mmHg, and the mean pressure after treatment with medication or surgery was 13.2 ± 4.32 mmHg.

Discussion: The average peak intraocular pressure after intravitreal injection of steroid of 22.3 ± 10.1 mmHg was similar to the 23.8 mmHg reported by Jonas, even though the amount of triamcinolone injected was different (4mg vs 25mg). The timing of the pressure rise was approximately the same, with this study finding the rise occurring in 54.5 ± 38.1 days, versus "one to two months" described by the Jonas group. However, in this consecutive series, a higher percentage of subjects required surgical intervention (11.1% vs 1.3%). A recent paper of nine subjects receiving 4mg of intravitreal triamcinolone for macular edema stemming from central retinal vein occlusion reported two subjects (22.2%) requiring medical therapy and one (11.1%) resulting in intractable glaucoma the necessitated surgical intervention.[11]

Conclusion: Intraocular pressure elevation is common with intravitreal injection of triamcinolone acetonide. However, with sufficient medical and surgical treatment, control of the intraocular pressure can be obtained, as the mean intraocular pressure. Therefore, careful measurement of the intraocular pressure, especially in the first 3 months after treatment, may assist in the recognition and prompt therapy of elevations of the pressure.

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A Novel GCAP1 Missense Mutation in a Family with Autosomal Dominant Cone-Rod Dystrophy

W.J. Dupps, MD, PhD
Dr. Edwin M. Stone, sponsor

Purpose: Guanylate cyclase activating protein 1 (GCAP1) is a calcium-dependent photoreceptor regulatory protein that has been localized to human cones and rods. Two GCAP1 mutations have previously been reported in association with autosomal dominant cone dystrophy (Y99C) and cone-rod dystrophy (P50L). In this study, a pedigree affected with autosomal dominant cone-rod dystrophy previously linked to a chromosome 6p21 locus was screened for disease-causing sequence variations in the GCAP1 gene.

Methods: Twenty-three members of a CRD pedigree underwent clinical examination and genetic analysis. Clinical testing included visual acuity, color testing, Goldmann perimetry, standardized full-field ERG, dark adaptometry and fundus photography. DNA prepared from peripheral blood of family members, 3 unaffected spouses and 200 normal subjects was screened for mutations in the coding sequence of the GCAP1 gene using automated DNA sequencing and SSCP analysis.

Results: Affected family members (12/23) experienced dyschromatopsia, photophobia and/or reduced visual acuity by the second decade of life. Characteristic features included a pigmentary maculopathy with central and paracentral scotomas, abnormal dark adaptation, and eventual progression to non-recordable cone responses on ERG (with attenuated rod responses). Linkage was demonstrated between the CRD phenotype and genetic markers from 6p21. Direct sequencing of the RDS gene revealed no disease-causing sequence variations. Sequencing of the GCAP1 gene in the proband detected a C to T missense mutation that would be expected to cause a Leu151Phe change in the GCAP1 protein. This change was present in all 12 affected family members, but absent from 11 unaffected family members, 3 unaffected spouses and 200 unrelated normal subjects.

Conclusions: A novel mutation (L151F) in the predicted calcium-binding EF4 hand domain of GCAP1 is associated with autosomal dominant cone-rod dystrophy. Current efforts are directed at designing paired-flash experiments to probe the rod recovery response in affected patients and normal volunteers to further define the electrophysiologic phenotype of this mutation.

A Novel Mutation (LEU396ARG) in OPA1 is Associated With a Severe Phenotype in a Large Dominant Optic Atrophy Pedigree

John H. Fingert, M.D., Ph.D., Andrew J. Lotery, M.D., FRCOphth, Jeremiah Brown, Jr., M.D., M.P.H., Louisa Affatigato, Val C. Sheffield, M.D., Ph.D.

Edwin M. Stone, M.D.,Ph.D., sponsor

Purpose: Dominant optic atrophy (DOA) is a degenerative disease of the optic nerve with autosomal dominant inheritance which causes decreased visual acuity in early childhood. Recently, the disease-causing gene for this disorder (OPA1) was identified. In this study, a large pedigree affected with a severe form of DOA was screened for the presence of disease-causing mutations in the OPA1 gene.

Methods: Fifty-six members of a DOA pedigree were studied. Most affected members of this family experienced visual loss (20/40 or poorer) in the first decade of life and most (9/16 eyes) progressed to 20/800 or poorer vision by age 60. Twenty-seven clinically affected family members; 5 obligate carriers; 26 siblings; and 9 spouses were included in this study. DNA was prepared from the blood of study subjects and screened for mutations in the coding sequence of the OPA1 gene using SSCP analysis. Automated sequencing was used to identify the sequence variations detected by SSCP analysis.

Results: Two sequence variations, LEU396ARG and ALA536ALA were identified in the proband of the DOA pedigree. The LEU396ARG mutation was identified in all twenty-seven affected family members as well as in all five obligate carriers. The LEU396ARG mutation was not identified in any control subjects. The overall penetrance of the LEU396ARG mutation in this family was 77%.

Conclusion: A novel OPA1 mutation (LEU396ARG) is associated with a severe phenotype of DOA.

A Modification of the Cutler-Beard Procedure Utilizing Donor Achilles Tendon for Upper Eyelid Reconstruction

Erin L. Holloman, MD
Dr. Keith D. Carter, sponsor

Purpose: Upper eyelid defects present challenges for ophthalmic reconstructive surgeons. The upper lid is a complex structure that must maintain its stability and motility for optimal function and cosmesis. Traditionally, large defects have been repaired by the two stage Cutler-Beard procedure. The first stage advancement flap only transplants soft tissue without tarsus. Without this tarsal stability, post procedure entropion and lid shrinkage have most frequently been described. Through the years, surgeons have tried many different substances to lend support to the new upper eyelid, some with complications. Currently, autogenous cartilage is most frequently used. We propose using donor Achilles tendon for increased stability of the upper lid when repairing large defects by the Cutler-Beard procedure.

Methods: A modified version of the Cutler-Beard procedure utilizing donor Achilles tendon as tarsal replacement was performed in four patients with large upper eyelid defects.

Results: Patients were examined in follow up and all cases were successful in recreating the upper eyelid. None developed infection or dehiscence. No secondary ptosis, retraction, or lid malposition have been found.

Conclusions: The replacement of upper eyelid tarsal stability with Achilles tendon as part of the Cutler-Beard procedure was successful in repairing four patients with large upper lid defects. The tendon graft is easily placed and incorporated into the normal lid anatomy. The tissue is readily available from most tissue banks. The modification produced excellent functional and cosmetic results without complications.

Identification of a Novel mtDNA Mutation in a Family With an Anterior Ischemic Optic Neuropathy Phenotype

J.G. Howard, MD. Jacobson,
Drs. Sohan Singh Hayreh and Edwin M. Stone, sponsors

Purpose: Six members of a pedigree were each diagnosed with anterior ischemic optic neuropathy (AION) in their 40's or 50's. These patients were screened for mitochondrial mutations to determine if they were actually affected with a late-onset form of Leber's hereditary optic neuropathy (LHON) rather than true AION.

Methods: The mitochondrial DNA of the proband was sequenced and then compared against the revised Cambridge reference sequence. When a novel mutation that changed an amino acid was identified in the ND1 gene of the proband, other family members, 41 AION patients, and 1488 LHON probands were screened for this mutation.

Results: Six affected members of this family first developed symptoms of AION in their forties or fifties, and all were related to one another through females. A novel mitochondrial mutation was identified in all six family members who had been diagnosed with AION. A guanine to adenine change was identified at position 4132 which would be expected to cause an ALA276THR change in the protein encoded by the ND1 gene. Four unaffected family members also harbored this mutation, but it was not identified in any of the 41 AION or the 1488 typical LHON probands in the study.

Conclusions: A novel mitochondrial DNA mutation (4132 G->A) is associated with late onset Leber's hereditary optic neuropathy. This mutation appears to be rare since it was not identified in a large group of LHON patients.

The Effect of Spherical Aberration Induced by a Contact Lens Model on Subjective and Objective Visual Function

Jennifer J.Y. Lee, MD
Drs. Ayad A. Farjo and Christine Sindt, sponsors

Purpose: To design contact lenses that predictably induce spherical aberration in similar quantities and zones to eyes that have undergone myopic photorefractive keratectomy or laser epithelial keratomileusis.

Methods: The material used for the contact lenses was Hioxifilcon A, which is 59% H20 and non-ionic. Contact lenses were designed with a standard base curve of 8.6mm and with a central optical zone of 6.0mm. The central power ranged from -5.00 to -8.00 in 0.5 diopter increments. A hyperopic aspheric periphery that increased proportionately to the amount of central myopic power was added to the design. The target amount of spherical aberration was determined from a pre-existing database correlating the increased amount of spherical aberration after photorefractive keratectomy or laser epithelial keratomileusis. Ten volunteers (20 eyes) underwent ray tracing and Hartmann-Shack aberrometry. The volunteers were fit with contact lenses and the ray tracing and Hartmann-Shack aberrometry scans were repeated to demonstrate the increase in spherical aberration with the contact lenses.

Results: The contact lenses reliably induce spherical aberration as measured by ray-tracing and Hartmann-Shack aberrometry.

Conclusion: We have created contact lenses that can predictably increase spherical aberration in similar levels and zones to eyes that have undergone myopic photorefractive keratectomy or laser epithelial keratomileusis. These lenses may serve as a model to investigate the effect of spherical aberration on subjective visual function.

Support: Supported in part by a grant from The University of Iowa Department of Ophthalmology Residents and Fellows Research Program.

Photodynamic Therapy of Subfoveal and Juxtafoveal Choroidal Neovascularization in Ocular Histoplasmosis Syndrome: A Retrospective Case Series

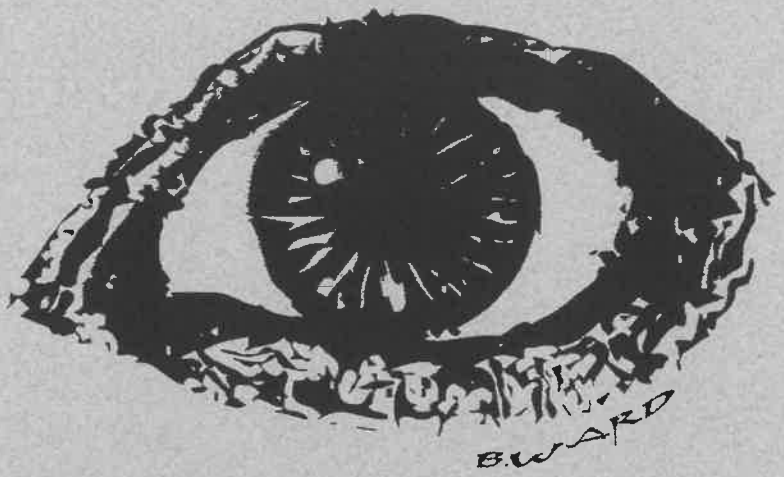
Judy C. Liu, M.D.
H. Culver Boldt, M.D., James C. Folk, M.D., Karen M.Gehrs, M.D., sponsors

Purpose: To evaluate the safety and effect on visual acuity of photodynamic therapy (PDT) with verteporfin in patients with subfoveal and juxtafoveal choroidal neovascular membranes from ocular histoplasmosis syndrome (OHS).

Methods: Retrospective case series. The visual outcome of eleven patients with subfoveal (n=6) and juxtafoveal (n=5) choroidal neovascularization treated with PDT was reviewed. At 1-3 month follow-up, retreatment with PDT was performed if angiography showed leakage.

Results: Within the subfoveal group, three patients (50%) had improved vision (2 or more lines better than initial vision), two patients (33.3%) had no change in vision (within 1 line), and one (16.7%) lost 4 lines of vision. At last follow-up, three patients (50%) had vision between 20/20-20/40 compared with only one patient (16.6%) at the initial visit. Mean follow-up was 13.7 months. Within the juxtafoveal group, three patients (60%) had improved vision, one patient (20%) had no change in vision, and one patient (20%) lost 9 lines of vision. At last follow-up, three of five patients (60%) had vision between 20/20-20/40 compared with two patients (40%) at the initial visit. Mean follow-up was 10.2 months. No significant adverse effects were reported.

Conclusion: PDT is a safe and promising option for patients with OHS with choroidal neovascularization that is subfoveal or juxtafoveal.



RESIDENT/FELLOW RESEARCH DAY

June 5, 2004

DEPARTMENT OF OPHTHALMOLOGY AND VISUAL SCIENCES

UNIVERSITY OF IOWA ROY J. AND LUCILLE A. CARVER COLLEGE OF MEDICINE

UNIVERSITY OF IOWA HOSPITALS & CLINICS

IOWA CITY, IOWA

Braley Auditorium
01136 Lower Level
Pomerantz Family Pavilion
8:00 AM – 1:30 PM

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Karl C. Ossoinig, M.D.
Edward S. Perkins, M.D., Ph.D.
William E. Scott, M.D.
H. Stanley Thompson, M.D.

ASSOCIATE EMERITUS

E. Lee Allen

PROFESSORS

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Keith D. Carter, M.D.
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Randy H. Kardon, M.D., Ph.D.
Young H. Kwon, M.D., Ph.D.
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RESIDENT/FELLOW RESEARCH DAY - 2004

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GLAUCOMA
Edward Sung, M.D.

NEURO-OPHTHALMOLOGY
Sonalee Kulkarni, M.D.

OCULOPLASTICS
Alice Song, M.D.

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John F. Fingert, M.D., Ph.D.
Erin L. Holloman, M.D.
Jennifer J. Lee, M.D.
Judy C. Liu, M.D.

SECOND-YEAR RESIDENTS

Michael V. Boland, M.D., Ph.D.
Andrew P. Doan, M.D., Ph.D.
Lynn Fraterrigo, M.D.
James G. Howard, M.D.
Sudeep Pramanik, M.D.

FIRST-YEAR RESIDENTS

James M. Coombs, M.D.
Reid Longmuir, M.D.
Jeffrey Maassen, M.D.
Erin O'Malley, M.D.
Erin Shriver, M.D.

ORTHOPTIC STUDENTS

Sara Downes, B.S.
Rebecca Parrish, B.A.

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Research Day is supported in part by
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Alcon Pharmaceuticals.

RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Saturday, June 5, 2004

10:30 **BREAK**

RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Saturday, June 5, 2004

RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Saturday, June 5, 2004

Presenting at Morning Rounds

Wednesday, June 2, 2004

Manuscripts Submitted

Assessment of Improvement in Visual Acuity During Amblyopia Treatment Using The Iowa Filter Bar

Michael G. Hunt, M.D.
Richard J. Olson, M.D., Ronald V. Keech, M.D., sponsors

Background: The assessment of visual acuity changes in very young children undergoing treatment for amblyopia is problematic. While preferential looking techniques and VEP play a role, the most common clinical method for assessment is fixation preference with or without a prism to induce a tropia. Previous studies have developed techniques to enhance the fixation preference test, but these are not commercially available and can be expensive to fabricate. In phase 1 of our study a pilot study with an inexpensive, easy-to-make filter bar with Fresnel prisms and a graded set of Bangerter foils (Iowa filter bar) was shown to progressively degrade visual acuity in adults.

Purpose: To determine if the Iowa filter bar can reliably track improvement in visual acuity during amblyopia treatment (phase 2)

Methods: Optotype visual acuity and fixation preference using the Iowa filter bar were tested in amblyopic children 5 years of age or under who could perform optotype visual acuity testing. Children were followed for 3 visits or until vision was equal. Comparison between visual acuity and filter strength used to cause a switch in fixation to the amblyopic eye was made.

Results: The successive graded filters were shown to progressively degrade visual acuity in adults. Data is currently still being collected on phase 2 of the study.

Conclusion: Pending.

Relationship Between Optic Nerve Pallor and Retinal Nerve Fiber Layer Thinning

Sonalee Kulkarni M.D.
Andrew Lee MD, Michael Wall MD, and Randy Kardon MD PhD, sponsors

Purpose: to determine the incidence of optic nerve pallor in eyes with optic neuropathy undergoing retinal nerve fiber layer measurement by optical coherence tomography (OCT). This will be done to determine how often thinning of the retinal nerve fiber layer can occur without pallor and whether pallor can occur without significant loss of the retinal nerve fiber layer.

Methods: Eyes with different forms of optic neuropathy (ischemic, compressive, recovered optic neuritis, resolved pseudotumor cerebri, and congenital causes) were examined and the presence or absence of pallor was recorded. Pallor was also assessed from optic disc photography, when performed. In the same eyes, visual field testing and measurement of the retinal nerve fiber layer thickness was also performed. The incidence of pallor was computed as a function of the number of significantly thinned clock-hour sectors of the retinal nerve fiber layer analysis (OCT3), and the diagnostic category.

Results: Will be presented.

Ultra Long-Term Outcomes of Penetrating Keratoplasty for Keratoconus

Sudeep Pramanik, M.D., M.B.A.
Ayad Farjo, M.D. and John Sutphin, M.D., sponsors

Purpose: Keratoconus is a progressive, noninflammatory, bilateral degeneration of the central and paracentral corneal stroma that can lead to irregular myopic astigmatism. Penetrating keratoplasty is a well-accepted treatment for advanced keratoconus. Current studies have reported "long-term" graft survival data up to five years from the time of transplant. Also, scattered reports of late recurrence of keratoconus have been described, but the rate and predisposing factors are unclear.

Methods: We will review retrospectively the records of all patients with keratoconus who underwent penetrating keratoplasty at UIHC more than 20 years ago to determine the rate of ultra long-term graft survival. Secondary outcome measures would include visual acuity, rejection episodes, complications, recurrence of keratoconus, secondary procedures, and need for repeat corneal transplant.

Results: We collected data on 107 eyes of 81 patients with a mean followup of 173 months. Preliminary analysis indicates a recurrence rate for keratoconus of approximately 5% among our patients. Further analysis regarding risk factors for graft failure and disease recurrence will be presented in June.

Support: Supported in part by a grant from The University of Iowa Department of Ophthalmology Residents and Fellows Research Program.

Characterization of Wavefront Aberrations in Patients Who Underwent Deep Lamellar Endothelial Keratoplasty (DLEK)

James M. Coombs, M.D.
Kenneth Goins, M.D. and John Sutphin, M.D., sponsors

Background: The standard treatment for replacement of the failed corneal endothelium is a full thickness corneal transplant or penetrating keratoplasty (PKP). Post operative astigmatism and anisometropia can limit useful vision in these patients. Deep Lamellar Endothelial keratoplasty (DLEK) is a new procedure whereby a deep, 5.0 to 9.0 mm length, limbal incision is made, then a lamellar dissection is performed throughout the entire cornea, and the posterior one-third of the central corneal tissue thickness is replaced by a similar lenticule of donor tissue with a healthy endothelial layer. Early clinical results of this technique have demonstrated significantly less postoperative corneal astigmatism and faster visual rehabilitation for the patient as compared to the results after PKP. Despite the theoretical advantages of DLEK, only 44% of patients at one year after surgery have a visual acuity 20/40 or better, as compared to approximately 70% of patients after PKP.

Purpose: The purpose of this investigation is to characterize the wavefront aberrations in patients who undergo DLEK and to compare these findings with the wavefront aberrations present in PKP patients. In addition, we want to determine if higher order wavefront aberrations limit the final visual acuity in DLEK patients.

Methods: Preoperative examination of patients will involve a complete eye examination including measurements of uncorrected Snellen visual acuity (UCVA), best corrected Snellen visual acuity (BCVA), corneal topographic mapping (ORBSCAN II), and pachymetry of the central cornea. Postoperatively, the patients will have the same studies done at six, twelve, twenty four, and thirty-six months with the addition of endothelial cell counts of the central graft. Standard post-surgical followup will occur as well but data will only be gathered at these time points. Outcome measures will include: uncorrected Snellen visual acuity (UCVA), best corrected Snellen visual acuity (BCVA), total corneal astigmatism and posterior surface elevation by ORBSCAN corneal topography, refractive corneal astigmatism, total wavefront error, quantitation and characterization of higher order wavefront error, and endothelial cell counts. Comparison of postoperative measurements will be made with the patient's preoperative measurements, and these findings will be compared to current literature reports on PKP outcomes.

Results: Not yet available

Conclusions: Not yet available.

Web-Based, Parent-Directed Vision Screening for Amblyopia Detection in Children

Erin O'Malley, M.D.
Richard J. Olson, M.D., sponsor

Background: Amblyopia is the most common cause of decreased vision in childhood. It is characterized by poor vision in one or both eyes, which occurs secondary to inadequate visual stimulation during the period when the visual pathways are plastic. It is present in 2-4% of the general population and represents a potentially reversible cause of vision loss. The prognosis for reversing amblyopia, which can be caused by strabismus, anisometropia, or media opacity such as cataract, depends on the age of the patient at the time that amblyopia is recognized as well as the severity of amblyopia.

The American Academy of Pediatric Ophthalmology and Strabismus (AAPOS) and the American Academy of Pediatrics (AAP) guidelines state that vision screening should be performed by the pediatrician on the first day of life and during well-baby examinations by assessing the red reflex. The guidelines recommend that visual acuity first be assessed at 2.5 to 5 years of age using a chart of Snellen letters, tumbling E's or Allen optotypes. If vision less than 20/40 is detected or there is a difference of 2 lines or more, the AAP recommends that the patient be referred to an ophthalmologist for evaluation. An additional method in use for sceening young children for amblyopia is photo-screening. Also, some school-aged children have visual acuity screening performed when they enter school. However, this is variable around the United States. We propose that a free, web-based service that is available as a quick, straight-forward, vision screening tool for parents to test their 2-5 year olds, would add to the body of programs currently available to screen young children for amblyopia.

The web-based program developed by Dr. Rick Olson fulfills the purpose of being widely accesible, free and easy to use. It is adminstered by a parent, testing one eye at a time, using single optotypes with crowding bars to simulate line letters. The computer algorithm matches the patients answers with an overall score for each eye. This score (from 1 to 15) corresponds to visual acuity. Any decreased visual acuity or a difference between the two eyes prompts referral information for further evaluation by a pediatric ophthalmologist. Preliminary studies have demonstrated that 3-7 year old children can be successfully screened using the software. (Further results of preliminary testing will be presented by Dr. Glen Bianchi.) Another important role of the website is as a tool to provide free, accurate information educating parents regarding amblyopia and the importance of vision screening.

Methods: Parents of patients being seen in the Pediatric Ophthalmology Clinic will be invited to participate. Children between 2 and 7 years of age will have visual acuity testing performed by the parent using the web-based software in the clinic. These patients will also be screened using traditional methods (BVAT) in the clinic. We will assess the reliability of the results generated by the computer screening by comparing the visual acuity information from the web-based screening with the information from the BVAT screening. We also plan to implement more widespread use of the software by having parents screen their children in their homes using their own computers and the web-based program, and plan to compare the data collected in this part of the trial with the in-clinic testing.

Visual Outcomes and Complications of Resident and Fellow Refractive Surgery

P.K. Row, M.D.
K.M. Goins, M.D. and J.E. Sutphin, M.D., sponsors

Purpose: Excimer laser refractive surgery is rapidly becoming an important and necessary skill for the comprehensive ophthalmologist. However, currently only a few academic institutions incorporate this surgery into their curriculum because of several issues including cost, risks of complications and fear of poor visual outcomes. We wish to present data from our institution that show excellent visual outcomes as well as low complication rates by trainees.

Methods: This study is a retrospective chart review of all consecutive patients from inception on 11/16/01 to 11/22/03. All patients recieved a preoperative screening exam and were followed postoperatively at one hour, one day, one week, one month, 3 months, 6 months, and 12 months. Several data points were gathered including vision, complications, suction time, flap thickness and the change in wavefront aberrations.

Results: Results of 50 consecutive patients (93 eyes) were reviewed. The average number of cases per trainee was 8. Surface ablation (LASEK or PRK) was done in 26% of eyes and LASIK in 76%. Our preliminary data shows that 75% achieved uncorrected snellen visual acuity of 20/20 or better with 50% achieving 20/15 at one month follow up, 81% achieved 20/20 or better with 57% achieving 20/15 at 3 months follow up, 100% achieved 20/20 or better with 81% achieving 20/15 at 6 months follow up, and 100% achieved 20/20 or better with 50% achieving 20/15 at 12 months follow up. Fifteen percent of eyes experienced complications requiring intervention including DLK, infection, and flap associated complications.

Conclusions: This demonstrates the potential for excellent visual outcomes after refractive surgery by trainees. Although the overall rate of complications incurred is higher than that of experienced refractive surgeons, none resulted in loss of best spectacle corrected visual acuity.

Modified Levator Recession and Muellerectomy for Lid Retraction Secondary to Thyroid Ophthalmopathy

Erin Shriver, M.D.
Keith Carter, M.D., sponsor

Purpose: Eyelid retraction is the most common sign of thyroid ophthalmopathy. Lid retraction results when the horizontal tarsal ligamentous band and vertical eyelid retractors cannot lengthen to accommodate increasing exophthalmos. Upper eyelid retraction has been associated with a startled appearance, ocular discomfort, and keratopathy. Non-surgical treatments have been tried with minimal success. There is no clear agreement on the best surgical lengthening technique for upper eyelid retraction. One popular technique is the levator recession and muellerectomy. This surgery is often successful at restoring the natural lid length, however the upper lid crease is often sacrificed in the process. Dr. Keith Carter is currently performing a modified version of levator recession and muellerectomy aimed at lengthening the lid while preserving the upper lid crease. The purpose of this study is to assess if the modified levator recession and muellerectomy successfully restores the upper lid crease.

Methods: We will be assessing the prominence of the upper lid crease after modified levator advancement and muellerectomy. The extent of scleral show, palpebral fissure height, margin-reflex distance, and upper eyelid crease will be measured from photographs taken before and after the patient's surgery. The prominence of the upper lid crease will be scored in both pre and post-operative photos.

Results and Conclusions: Pending.

Validity of A Web-Based Vision Screening Tool

Glen M. Bianchi, M.D.
Richard J. Olson, M.D., sponsor

Introduction: Effective yet inexpensive methods of vision screening for the general pediatric population continue to be elusive. Multiple modalities ranging from volunteer optotype testing to photoscreening have been used with mixed success. The Internet, though ubiquitous in popular culture, is still a relatively untapped resource for vision screening. To be a valid vision screening tool, a web-based program must generate accurate results, without professional assistance, in a broad range of settings, with users of varying levels of computer skill.

Methods: We designed a web-based preschool vision screening tool through application of the "usability" model of computer programming. Children recruited from our clinic were first evaluated as part of a parent/child "team." In a room with a computer linked to the internet, and with no outside assistance, the parent and child performed the web-based test. Visual acuity was then measured in a masked fashion by the staff of the clinic using randomly generated, "surrounded HOTV" optotypes as a normal portion of their clinic visit.

Results: Visual acuity results using the web-based tool correlated well with acuities measured by health-care professionals using traditional methods.

Conclusions: Fewer than 25% of preschool children are currently screened for amblyopia in the United States. A free, accessible, usable and clinically validated screening tool may offer many advantages over current methodologies. Further validation in children's own homes, using their own computers, is ongoing.

Multifocal Visual Evoked Potentials (mfVEP) in Compressive Optic Neuropathy

Alice Song, M.D.
Keith Carter, M.D., Jeffrey Nerad, M.D., sponsors

Purpose: To evaluate the efficacy of the multifocal VEP (mfVEP) in evaluating local optic nerve damage in compressive optic neuropathy and to correlate the sensitivity of mfVEP with visual acuity (Va), SITA 24-2 Humphrey visual fields (HVF), relative afferent pupillary defect (RAPD), and critical flicker fusion (cff) frequency.

Methods: Prospective study of patients with compressive optic neuropathy based on subjective decreased Va, RAPD, decreased cff, or changes in visual fields. Evaluation of these parameters was performed prior to and after surgical intervention to alleviate the compression. Inclusion criteria included predominantly unilateral compressive optic neuropathy from Graves' ophthalmopathy, optic nerve lesions, orbital tumors, idiopathic intracranial hypertension. Exclusion criteria included previous intervention for the compressive optic neuropathy and history of optic nerve or retinal nerve fiber layer damage.

Results: Analysis of preoperative and postoperative measurements were performed on 4 patients, 3 with Graves' compressive optic neuropathy, and 1 with suprasellar and orbital meningioma. Information on mfVEP analysis included 1) signal of <90 nV, 2) amplitude deviation plot, 3) intereye asymmetry comparison. There was correlation with improvement in HVF and improvement in some mfVEP parameters in patients.

Conclusions: Our pilot study suggests some mfVEP results correlate with HVF changes in compressive optic neuropathy and may be more sensitive in detecting changes in visual field defects. A larger database is required to determine which parameters of the mfVEP may correlate more reliably with the severity of neuropathy.

Support: Supported in part by a grant from The University of Iowa Department of Ophthalmology Residents and Fellows Research Program.

Transmission Electron Microscopic Evaluation of a Post Mortem Globe Treated with Photodynamic Therapy for a Subfoveal Choroidal Neovascular Membrane Secondary to Age Related Macular Degeneration

Jason Sanders, M.D.
Greg Hageman, Ph.D., sponsor

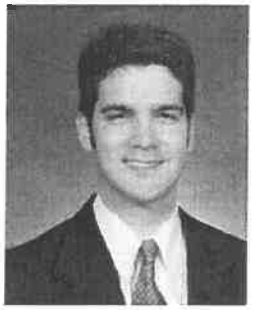
Methods: Post mortem evaluation of globes using a transmission electron microscope.

Results: The subject had a past ocular history of age related macular degeneration (ARMD). Her right eye had undergone focal laser photocoagulation for a juxtafoveal choroidal neovascular membrane (CNVM). The left eye recently had been treated with two sessions of Photodynamic Therapy (PDT) for a subfoveal CNVM. Both globes were harvested post mortem after a fatal myocardial infarction. Post therapeutic micro-structural analysis was performed using the Transmission Electron Microscope (TEM) of the left eye.

The TEM demonstrated the presence of a perfused CNVM in the subretinal space of the left eye. The neurosensory retina showed little disorganization, however, there was prominent disruption of the chorio-caprillaris (CC) and retinal pigmented epithelium (RPE).

Conclusions: PDT is a novel treatment for subfoveal CNVM secondary to ARMD. PDT has a theoretical benefit of concentrating its therapeutic efficacy on the pathologic CNVM while sparing the delicate neurosensory retina, RPE and CC. However, this evaluation of a globe treated with PDT and studied with TEM demonstrated continued perfusion of the CNVM as well as evidence of collateral damage to the CC and RPE.

Retrospective Analysis of Acanthamoeba Keratitis Diagnosed by Confocal Microscopy



Jeffrey L. Maassen, M.D.
Kenneth M. Goins, M.D., sponsor

Purpose: Confocal microscopy is a relatively new diagnostic modality in the field of ophthalmology. The confocal microscope utilizes a single point source of light to illuminate an object while this light is simultaneously detected by a point detector in phase with the source. This allows for resolution not only in the horizontal axis but the vertical axis as well. This property makes it ideal for imaging translucent tissues like the cornea. One area that the confocal microscope has excelled at is diagnosing Acanthamoeba keratitis. Acanthamoeba are a free-living parasites that are ubiquitous in our world, found in water (fresh water as well as tap water), air, and soil. Acanthamoeba can cause a serious keratitis and was previously difficult to diagnose without invasive testing. Additionally, Acanthamoeba is difficult to culture. Confocal microscopy has made it easier to non-invasively detect the dormant cysts or active trophozoites of Acanthamoeba infecting the cornea.

While confocal microscopy has previously been shown to be a sensitive way to diagnose Acanthamoeba keratitis, there are situations where the confocal microscope will apparently detect Acanthamoeba in the cornea, but the epithelial biopsy will be negative. This presents a dilemma because patients with Acanthamoeba keratitis often require long-term therapy.

Methods: We will retrospectively review consecutive cases of Acanthamoeba keratitis diagnosed by confocal microscopy over the past year. We will then correlate and compare these results with epithelial biopsies of these patients or from corneal button results following penetrating keratoplasty. The primary goal of this project will be to establish the diagnostic certainty of our confocal microscope compared to tissue diagnosis.

Imaging the Retinal Function Using the Intrinsic Optical Signal

Michael Abramoff, M.D., Ph.D., Daniel Ts'o, Ph.D., Peter Soliz, Ph.D.

Randy Kardon, M.D. Ph.D., Young H. Kwon, M.D. Ph.D., sponsors

Aim: To image neural activity related signals due to visual stimuli using intrinsic signal optical imaging, a technique whereby the changes in reflectance to light of a specific wavelength are measured, analyzed and mapped.

Methods: Anesthetized cats (n=3) and awake humans (n=4) were used as subjects. A custom built modified fundus camera illuminated (780nm) the retina and imaged the reflectance of the retina with a sensitive cooled CCD video camera, while the subject was looking at counterflickering checkerboards in the shape of vertical and horizontal bars (~5° arc) (550nm). Changes in reflectance were analyzed using principal component analysis and other image processing techniques, resulting in 'functional maps' and signal time courses.

Results: In anesthetized cats, functional maps show that measurable optical changes occur in the area of the retina that was stimulated visually. In awake humans, the signal is less clear spatially, but the temporal course of the signal corresponded to the stimulus profile.

Conclusions: Intrinsic signal optical imaging is feasible in the retina in anesthetized cats and in awake humans. Further development and refinement of the technique may allow high spatial-resolution, non-invasive functional imaging of the retina. If successful, this is expected to essential for a better diagnosis and treatment follow-up of potentially blinding retinal diseases, especially glaucoma and diabetic retinopathy.

Intravitreal Kenalog for Uveitis

David S. Zumbro, M.D.
James C. Folk, M.D., sponsor

Purpose: Intravitreal injection of triamcinolone acetonide has been used to treat a variety of ocular diseases and appears to be well tolerated. We reviewed our experience using intravitreal triamcinolone injections in patients with severe uveitis to determine the effectiveness of treatment, duration of effect and complications.

Methods: After local IRB approval, a list of University of Iowa patients with the CPT code for intraocular injection from January 1, 1998 to the present was created. All the patient records were reviewed to sort out those who received intravitreal Kenalog for severe noninfectious uveitis. These records were then evaluated for: diagnosis, dose and method of injection, therapeutic effect, duration of effect, complications, and need for surgery or repeat injection.

Results: We identified 10 patients with severe uveitis who received intraocular Kenalog. Diagnoses included: multifocal choroiditis with panuveitis (3), sympathetic ophthalmia (3), serpiginous choroiditis (2), sarcoidosis (1), and uveitic glaucoma (1). All patients received 4mg/0.1ml of commercially available Kenalog (triamcinolone acetonide 40mg/ml) through the pars plana under topical anesthesia. Topical povidone iodine solution was used in each case to reduce the risk of infection. Patients received from one to ten injections during follow-up for a total of 27 injections. Mean followup was 14 months and ranged from 1 to 35 months. Improved vision (> 2 lines) occurred in 3 patients. 5 patients remained stable and 2 patients had worsening vision (>2 lines). All patients had reduced inflammation. No patient developed endophthalmitis. One patient required a seton for uncontrolled steroid response glaucoma. There were no other IOP complications. All three patients with sympathetic ophthalmia and one patient with multifocal choroiditis required multiple injections (3-10). Duration of effect was variable and related to severity of inflammation at time of injection and presence of a trabeculectomy or seton.

Conclusions: Intravitreal triamcinolone injection is effective in decreasing inflammation and stabilizing vision in patients with severe uveitis. Multiple injections may be required.

Analysis of Emergent Versus Planned Retinal Detachment Repair Outcomes

Matthew Wood, M.D.
Karen Gehrs, M.D., sponsor

Purpose: To examine outcomes of retinal reattachment surgery.

Methods: A chart review of retinal detachment repairs, excluding pneumatic retinopexy, performed from July 1, 2000 to June 30, 2002 at the University of Iowa Hospitals and Clinics. Factors considered include, days to repair from presentation, time of procedure, presence or absence of an afferent papillary defect, visual acuity, presence of hypotony, presence of proliferative vitreoretinopathy, macular attachment status, total operating room time, 3 and 6 month postoperative visual acuity, complications, and additional procedures performed.

Results: Pending.

Conclusion: Study is ongoing.

Changes in the Basal Dimensions of Ocular Melanoma Following I-125 Brachytherapy

E.M. Bowie, M.D.
H.C. Boldt, M.D., sponsor

Objective: To assess the changes in the basal dimensions of choroidal melanoma following I-125 brachytherapy.

Design: Retrospective case series. The charts, photographs and fluorescein angiograms of 200 patients in the Collaborative Ocular Melanoma Study (COMS) were reviewed.

Participants: Two hundred patients, each of whom had posterior uveal melanoma treated with I-125 brachytherapy in the COMS study.

Main outcome measures: There were two main outcome measures: 1) changes in the basal dimension of the tumor at 6 months and 1 year, and 2) enucleation.

Results: Pending.

Duration of Maximum Cycloplegia in Children Using Cyclopentolate 1%

Sara Downes, B.S.
Ronald V. Keech, M.D., Wanda L. Pfeifer, OC(C), COMT, sponsors

Purpose: The purpose of this study is to determine the duration of maximum cycloplegia in children using the dilating agent cyclopentolate 1%. For this study, maximum cycloplegia is defined as a difference of no greater than 0.5 diopters of residual accommodation from peak refraction.

Methods: This is a prospective study of the duration of maximum cycloplegia in children ages 4-12. Cyclopentolate 1% will be the cycloplegic agent used. The Nikon Speedy K autorefractor will be used to obtain measurements of refractive error. Measurements will be taken before the drops are administered and every 10 minutes after for 60 minutes to determine residual accommodation. Iris color will be graded using the Seddon, et al. iris color classification system. Data will be graphically analyzed as time versus residual accommodation in gradation of iris color.

Conclusion: Pending conclusion of this study.

Phenotypic Characterization of Blue Cone Monochromacy with Loss of the Locus Control Region

Michael A. Grassi, M.D., Benjamin R. Roos
Edwin M. Stone, M.D., Ph.D., sponsor

Purpose: To describe the phenotype of blue cone monochromacy associated with a deletion in the locus control region.

Methods: Polymerase chain reaction was used to characterize the molecular structure of the red pigment gene, the green pigment gene, and the locus control region (LCR) upstream of the red gene in a family with blue cone monochromacy. Affected individuals were examined with the use of extensive color vision testing, funduscopy, dark adaptometry, perimetry, and electroretinography (ERG).

Results: Analysis revealed a 16kb deletion extending from the proximal 9kb portion of the LCR through exon 1 and intron 1 of the red pigment gene. The remaining exons of the red gene as well as all of the exons of the green gene were present. Affected individuals had an interesting constellation of findings including: myopia, bilateral macular atrophy, poor central color vision with preserved peripheral color appreciation, and an attenuated photopic ERG response.

Conclusion: We report the association between loss of the LCR in blue cone monochromacy and bilateral macular atrophy with absent central color vision and preserved peripheral color vision.

Evaluation of Potential Risk Factors and Predictors of Vision Loss in Patients with Optic Disc Drusen

Reid Longmuir, M.D.
Randy Kardon, M.D., Ph.D. (primary) and Andrew G. Lee, M.D., sponsors

Background: Optic disc drusen occurs in approximately 3 in1000 patients, although autopsy studies suggest higher. They are found in both eyes in up to 75% of patients. Optic disc drusen have been associated with visual field defects which are typically slowly progressive, asymptomatic, and difficult to predict simply by visualization of the optic nerve. Disc drusen have been associated with nerve fiber layer loss as documented by red-free photography, histopathologic evaluation, and more recently optical coherence tomography. Despite this finding, limited data exists evaluating the risk factors for developing field loss when drusen are present. Similarly, rate of progression of visual field loss and correlation of nerve fiber layer loss with visual function has not been studied in a large group.

Purpose: To search for potential risk factors for visual field loss in patients with drusen. Examples include disc area, number and size of drusen, nerve fiber layer thickness, intraocular pressure, axial eye length, and pattern evoke potentials from the ganglion cell layer. To determine rate of visual field loss and to correlate nerve fiber layer thickness with visual field sensitivity.

Methods: Once institutional approval is obtained, we will retrospectively analyze visual fields of patients with diagnosed optic disc drusen, and compare age to visual field loss. The prospective arm will involve recruiting approximately 50 patients, with whom we will perform kinetic and static perimetry, OCT of the optic nerve and nerve fiber layer, and pattern electroretinogram testing. We will also obtain intraocular pressure, axial eye length, and echography to determine size and number of drusen present. This data will be collected to search for risk factors associated with visual field loss and/or progression. Finally, we will correlate nerve fiber layer thickness with visual field loss by averaging all regions of the field together, as well as individual field locations (superior and inferior arcuate regions, nasal bundle, and maculopapillary bundle).

Changes in Nerve Fiber Layer Reflectivity using Optical Coherence Tomography in the Setting of Optic Neuropathy

M.V. Boland, M.D., Ph.D.
R.H. Kardon, M.D., Ph.D., sponsor

Purpose: It has been observed in some patients with severe visual field loss from glaucoma and other optic neuropathies that the optical coherence tomography (OCT) estimate of the retinal nerve fiber layer is thicker than expected. Patients with acute optic neuropathy have been followed over time and showed initial thinning of the retinal nerve fiber layer, followed by some degree of re-thickening. The purpose of this work is to determine whether there are features of retinal OCT that can be used to differentiate a healthy nerve fiber layer from the damaged and paradoxically thickened ones described above.

Methods: Four patients with various optic neuropathies and subsequent nerve fiber layer thinning and re-thickening on longitudinal OCT data were identified. All OCT data were collected using a Zeiss Humphrey OCT2 and each patient had at least 12 months of follow up. Scans of the retina adjacent to the optic nerve in both the healthy and diseased eye were processed using third party software (OCTPro 2k1) to identify the nerve fiber layer. The raw reflectivity data from the nerve fiber layer were then exported and analyzed using simple statistics (e.g., mean, standard deviation) and histograms.

Results: The mean reflectivity of acutely damaged nerve fiber layers decreased over time and then remained low even as the layer re-thickened. Histogram analysis of reflectivity data are consistent with a decrease in the average reflectivity and do not demonstrate a multi-modal distribution of reflectivity, at least for nerves with severe damage.

Conclusions: The reflectivity of the nerve fiber layer is an important feature that is not currently used in analysis of OCT data. Furthermore, thickness of the nerve fiber layer alone is not a perfect predictor of visual field loss. We hypothesize that one reason for this discrepancy is the re-thickening phenomenon mentioned above. We also believe that the re-thickened nerve fiber layer may contain gliotic tissue that has replaced damaged nerve fibers. The observed change in the reflectivity of the nerve fiber layer, even after re-thickening, is consistent with the presence of non-nerve tissue. Finally, given the changes we have observed in the reflectivity of the nerve fiber layer, it may be possible to distinguish normal from abnormal tissue and better correlate thickness with function.

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Supported in part by a grant from The University of Iowa Department of Ophthalmology Residents and Fellows Research Program.

Central Retinal Vein Occlusion Associated with Cilioretinal Artery Occlusion

Lynn Fraterrigo, M.D.
Sohan Hayreh, M.D., Ph.D., sponsor

Background: Central retinal vein occlusion (CRVO) may be associated with cilioretinal artery occlusion. In cases of non-ischemic CRVO, cilioretinal artery occlusion may be the primary cause of severe visual loss and presentation. Case reports/series describing this clinical entity are rare. No large systematic study has been performed which defines the clinical presentation, features, and prognosis of CRVO with cilioretinal artery occlusion.

Methods: We will perform a detailed review of the medical record of all patients with the diagnosis of CRVO with cilioretinal artery occlusion seen in the Ocular Vascular Clinic at the University of Iowa Hospitals and Clinics between 1974 and 2002. Demographic and clinical features of this disease entity will be recorded and analyzed. The frequency of presenting clinical symptoms and signs will be determined. The area of the retina affected by cilioretinal artery occlusion and its influence on the initial and final visual loss will be recorded. Its management, natural history and visual outcome will be evaluated. Collected data will be examined for prognostic value. Co-morbidities including systemic medications, systemic disease and tobacco use will be investigated. These data will be compared to available population controls.

Determination of the Diurnal Fluctuation of Intraocular Pressure in Glaucoma Suspects and Open-Angle Glaucoma Patients

Andrew Doan, M.D., Ph.D.
Young Kwon, M.D., Ph.D., Wallace Alward, M.D., Emily Greenlee, M.D., sponsors

Purpose: The one-eye drug trial for glaucoma medications reducing the intraocular pressure (IOP) is based on the fundamental belief that the response to a particular agent will be similar in both eyes. Also, the diurnal fluctuation of the IOP is assumed to be similar in both eyes. Thus, once a physician has demonstrated an IOP-lowering effect in one eye, then the medication is added to the second eye. If there is no effect with the medication in the one-eye trial, then the medication is abandoned. A recent paper (Realini et al., Ophthalmology, March 2004, Vol. 111, 421-426) challenges the utility of the one-eye drug trial for assessing efficacy of IOP-lowering medications in glaucoma management. The purpose of our study is to determine the diurnal variation of IOP in a population of patients that are: 1) glaucoma suspects; 2) normal tension or primary open angle glaucoma patients; 3) receiving one-eye treatment with an IOP-lowering medication; and, 4) receiving bilateral treatment with an IOP-lowering medication.

Methods: Proper IRB approval will be obtained. This study is a comprehensive, retrospective chart review of the glaucoma patients who have had an IOP diurnal curve measured at the University of Iowa, Hospital and Clinics, Department of Ophthalmology. Amongst the greater than 900 diurnal curves on record, the patient record will be selected for the study if there is no evidence of: unilateral glaucoma, unilateral surgery, or unilateral trauma. The patient records will then be placed into four categories: 1) glaucoma suspects; 2) normal tension or primary open angle glaucoma patients; 3) receiving one-eye treatment with an IOP-lowering medication; and, 4) receiving bilateral treatment with an IOP-lowering medication. The difference in the IOP between each set of eyes at each time point will be analyzed by linear regression to determine if there is concordance in the diurnal fluctuation between the eyes. Furthermore, analysis of the absolute value of the standard deviation of the diurnal curves will denote the degree of fluctuation encountered.

Results and Conclusion: Pending

Intraocular Pressure Elevation with Injection of Intravitreal Triamcinolone Acetonide

Edward Sung, M.D.
Wallace L. M. Alward, M.D., James C. Folk, M.D., Young H. Kwon, M.D., Ph.D., David S. Zumbro, M.D.

Aim: To investigate the effects of intravitreal injections of trimacinolone acetonide on intraocular pressure, and understand the risk factors contributing to the pressure elevation.

Methods: Retrospective review of consecutive patients who received intravitreal injections by the Retina Service at the University of Iowa Department of Ophthalmology for treatment of macular edema or choroidal neovascular membrane.

Background: Intravitreal triamcinolone acetonide has been increasingly employed as an effective therapy for a number of retinal diseases with neovascular, inflammatory, or edematous mechanisms.[1,2,3,4,5,6] Studies have been performed to document the prolonged presence of intravitreal triamcinolone in rabbit models or by indirect ophthalmoscopy in humans.[7,8] Recently, an article has demonstrated measurable quantities of steroid persisting in the eye for 93 days from a single injection by anterior chamber aqueous sampling.[8] A relevant study reported the effects of intravitreal steroids on intraocular pressure, by Jonas *et al.*[9] In his paper, where a substantially larger dose of steroid was injected (25mg vs 4mg) about 50% of eyes showed an increase in pressure, typically at one to two months' post-injection. Though the data were not stratified according to the amount of elevation in intraocular pressure, a mean maximum eye pressure of 23.38 mmHg was reported, with one subject reaching an IOP of 60 mmHg, requiring filtering surgery. The remainder of the data in the literature regarding glaucomatous side effects are reported in papers whose main thrust are toward the efficacy of the treatment, and the clinical and anatomical changes in the individuals studied.[1,2,3,10]

Goal: The goal of this study is to investigate and confirm the effect of intravitreal injection of triamcinolone acetonide on intraocular pressure, to quantify the percentage of subjects who have marked increases in IOP, and to report the clinical course of those who required medical and surgical intervention.

Results: A total of 36 charts were reviewed, with the first injection of steroid evaluated as the primary source of data for intraocular pressure changes. There were 18 male and 18 female subjects, with a mean age ± standard deviation of 61.4 ± 16.3 years. The mean pre-injection pressure was 16.7 ± 7.93 mmHg and mean peak pressure was 22.3 ± 10.1 mmHg. The average final intraocular pressure was 13.3 ± 4.28 mmHg. Seventeen subjects (47.2%) had pressure elevations ≤5 mmHg, eleven subjects (30.6%) saw elevations of 6 to 10 mmHg, two subjects (11.1%) elevated from 11 to 15mmHg, and six subjects (16.7%) had elevations > 15mmHg. The average time to elevation, for subjects whose intraocular pressure elevated > 5mmHg, was 54.5 ± 38.1 days. Five subjects

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(13.9%) required medical intervention, while four (11.1%) required surgical intervention (trabeculectomy with mitomycin C in all four cases). The mean peak pressure of the treated subjects was 34.6 ± 8.56 mmHg, and the mean pressure after treatment with medication or surgery was 13.2 ± 4.32 mmHg.

Discussion: The average peak intraocular pressure after intravitreal injection of steroid of 22.3 ± 10.1 mmHg was similar to the 23.8 mmHg reported by Jonas, even though the amount of triamcinolone injected was different (4mg vs 25mg). The timing of the pressure rise was approximately the same, with this study finding the rise occurring in 54.5 ± 38.1 days, versus "one to two months" described by the Jonas group. However, in this consecutive series, a higher percentage of subjects required surgical intervention (11.1% vs 1.3%). A recent paper of nine subjects receiving 4mg of intravitreal triamcinolone for macular edema stemming from central retinal vein occlusion reported two subjects (22.2%) requiring medical therapy and one (11.1%) resulting in intractable glaucoma the necessitated surgical intervention.[11]

Conclusion: Intraocular pressure elevation is common with intravitreal injection of triamcinolone acetonide. However, with sufficient medical and surgical treatment, control of the intraocular pressure can be obtained, as the mean intraocular pressure. Therefore, careful measurement of the intraocular pressure, especially in the first 3 months after treatment, may assist in the recognition and prompt therapy of elevations of the pressure.

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A Novel GCAP1 Missense Mutation in a Family with Autosomal Dominant Cone-Rod Dystrophy

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Purpose: Guanylate cyclase activating protein 1 (GCAP1) is a calcium-dependent photoreceptor regulatory protein that has been localized to human cones and rods. Two GCAP1 mutations have previously been reported in association with autosomal dominant cone dystrophy (Y99C) and cone-rod dystrophy (P50L). In this study, a pedigree affected with autosomal dominant cone-rod dystrophy previously linked to a chromosome 6p21 locus was screened for disease-causing sequence variations in the GCAP1 gene.

Methods: Twenty-three members of a CRD pedigree underwent clinical examination and genetic analysis. Clinical testing included visual acuity, color testing, Goldmann perimetry, standardized full-field ERG, dark adaptometry and fundus photography. DNA prepared from peripheral blood of family members, 3 unaffected spouses and 200 normal subjects was screened for mutations in the coding sequence of the GCAP1 gene using automated DNA sequencing and SSCP analysis.

Results: Affected family members (12/23) experienced dyschromatopsia, photophobia and/or reduced visual acuity by the second decade of life. Characteristic features included a pigmentary maculopathy with central and paracentral scotomas, abnormal dark adaptation, and eventual progression to non-recordable cone responses on ERG (with attenuated rod responses). Linkage was demonstrated between the CRD phenotype and genetic markers from 6p21. Direct sequencing of the RDS gene revealed no disease-causing sequence variations. Sequencing of the GCAP1 gene in the proband detected a C to T missense mutation that would be expected to cause a Leu151Phe change in the GCAP1 protein. This change was present in all 12 affected family members, but absent from 11 unaffected family members, 3 unaffected spouses and 200 unrelated normal subjects.

Conclusions: A novel mutation (L151F) in the predicted calcium-binding EF4 hand domain of GCAP1 is associated with autosomal dominant cone-rod dystrophy. Current efforts are directed at designing paired-flash experiments to probe the rod recovery response in affected patients and normal volunteers to further define the electrophysiologic phenotype of this mutation.

A Novel Mutation (LEU396ARG) in OPA1 is Associated With a Severe Phenotype in a Large Dominant Optic Atrophy Pedigree

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Purpose: Dominant optic atrophy (DOA) is a degenerative disease of the optic nerve with autosomal dominant inheritance which causes decreased visual acuity in early childhood. Recently, the disease-causing gene for this disorder (OPA1) was identified. In this study, a large pedigree affected with a severe form of DOA was screened for the presence of disease-causing mutations in the OPA1 gene.

Methods: Fifty-six members of a DOA pedigree were studied. Most affected members of this family experienced visual loss (20/40 or poorer) in the first decade of life and most (9/16 eyes) progressed to 20/800 or poorer vision by age 60. Twenty-seven clinically affected family members; 5 obligate carriers; 26 siblings; and 9 spouses were included in this study. DNA was prepared from the blood of study subjects and screened for mutations in the coding sequence of the OPA1 gene using SSCP analysis. Automated sequencing was used to identify the sequence variations detected by SSCP analysis.

Results: Two sequence variations, LEU396ARG and ALA536ALA were identified in the proband of the DOA pedigree. The LEU396ARG mutation was identified in all twenty-seven affected family members as well as in all five obligate carriers. The LEU396ARG mutation was not identified in any control subjects. The overall penetrance of the LEU396ARG mutation in this family was 77%.

Conclusion: A novel OPA1 mutation (LEU396ARG) is associated with a severe phenotype of DOA.

A Modification of the Cutler-Beard Procedure Utilizing Donor Achilles Tendon for Upper Eyelid Reconstruction

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Purpose: Upper eyelid defects present challenges for ophthalmic reconstructive surgeons. The upper lid is a complex structure that must maintain its stability and motility for optimal function and cosmesis. Traditionally, large defects have been repaired by the two stage Cutler-Beard procedure. The first stage advancement flap only transplants soft tissue without tarsus. Without this tarsal stability, post procedure entropion and lid shrinkage have most frequently been described. Through the years, surgeons have tried many different substances to lend support to the new upper eyelid, some with complications. Currently, autogenous cartilage is most frequently used. We propose using donor Achilles tendon for increased stability of the upper lid when repairing large defects by the Cutler-Beard procedure.

Methods: A modified version of the Cutler-Beard procedure utilizing donor Achilles tendon as tarsal replacement was performed in four patients with large upper eyelid defects.

Results: Patients were examined in follow up and all cases were successful in recreating the upper eyelid. None developed infection or dehiscence. No secondary ptosis, retraction, or lid malposition have been found.

Conclusions: The replacement of upper eyelid tarsal stability with Achilles tendon as part of the Cutler-Beard procedure was successful in repairing four patients with large upper lid defects. The tendon graft is easily placed and incorporated into the normal lid anatomy. The tissue is readily available from most tissue banks. The modification produced excellent functional and cosmetic results without complications.

Identification of a Novel mtDNA Mutation in a Family With an Anterior Ischemic Optic Neuropathy Phenotype

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Purpose: Six members of a pedigree were each diagnosed with anterior ischemic optic neuropathy (AION) in their 40's or 50's. These patients were screened for mitochondrial mutations to determine if they were actually affected with a late-onset form of Leber's hereditary optic neuropathy (LHON) rather than true AION.

Methods: The mitochondrial DNA of the proband was sequenced and then compared against the revised Cambridge reference sequence. When a novel mutation that changed an amino acid was identified in the ND1 gene of the proband, other family members, 41 AION patients, and 1488 LHON probands were screened for this mutation.

Results: Six affected members of this family first developed symptoms of AION in their forties or fifties, and all were related to one another through females. A novel mitochondrial mutation was identified in all six family members who had been diagnosed with AION. A guanine to adenine change was identified at position 4132 which would be expected to cause an ALA276THR change in the protein encoded by the ND1 gene. Four unaffected family members also harbored this mutation, but it was not identified in any of the 41 AION or the 1488 typical LHON probands in the study.

Conclusions: A novel mitochondrial DNA mutation (4132 G->A) is associated with late onset Leber's hereditary optic neuropathy. This mutation appears to be rare since it was not identified in a large group of LHON patients.

The Effect of Spherical Aberration Induced by a Contact Lens Model on Subjective and Objective Visual Function

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Purpose: To design contact lenses that predictably induce spherical aberration in similar quantities and zones to eyes that have undergone myopic photorefractive keratectomy or laser epithelial keratomileusis.

Methods: The material used for the contact lenses was Hioxifilcon A, which is 59% H20 and non-ionic. Contact lenses were designed with a standard base curve of 8.6mm and with a central optical zone of 6.0mm. The central power ranged from -5.00 to -8.00 in 0.5 diopter increments. A hyperopic aspheric periphery that increased proportionately to the amount of central myopic power was added to the design. The target amount of spherical aberration was determined from a pre-existing database correlating the increased amount of spherical aberration after photorefractive keratectomy or laser epithelial keratomileusis. Ten volunteers (20 eyes) underwent ray tracing and Hartmann-Shack aberrometry. The volunteers were fit with contact lenses and the ray tracing and Hartmann-Shack aberrometry scans were repeated to demonstrate the increase in spherical aberration with the contact lenses.

Results: The contact lenses reliably induce spherical aberration as measured by ray-tracing and Hartmann-Shack aberrometry.

Conclusion: We have created contact lenses that can predictably increase spherical aberration in similar levels and zones to eyes that have undergone myopic photorefractive keratectomy or laser epithelial keratomileusis. These lenses may serve as a model to investigate the effect of spherical aberration on subjective visual function.

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Photodynamic Therapy of Subfoveal and Juxtafoveal Choroidal Neovascularization in Ocular Histoplasmosis Syndrome: A Retrospective Case Series

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Purpose: To evaluate the safety and effect on visual acuity of photodynamic therapy (PDT) with verteporfin in patients with subfoveal and juxtafoveal choroidal neovascular membranes from ocular histoplasmosis syndrome (OHS).

Methods: Retrospective case series. The visual outcome of eleven patients with subfoveal (n=6) and juxtafoveal (n=5) choroidal neovascularization treated with PDT was reviewed. At 1-3 month follow-up, retreatment with PDT was performed if angiography showed leakage.

Results: Within the subfoveal group, three patients (50%) had improved vision (2 or more lines better than initial vision), two patients (33.3%) had no change in vision (within 1 line), and one (16.7%) lost 4 lines of vision. At last follow-up, three patients (50%) had vision between 20/20-20/40 compared with only one patient (16.6%) at the initial visit. Mean follow-up was 13.7 months. Within the juxtafoveal group, three patients (60%) had improved vision, one patient (20%) had no change in vision, and one patient (20%) lost 9 lines of vision. At last follow-up, three of five patients (60%) had vision between 20/20-20/40 compared with two patients (40%) at the initial visit. Mean follow-up was 10.2 months. No significant adverse effects were reported.

Conclusion: PDT is a safe and promising option for patients with OHS with choroidal neovascularization that is subfoveal or juxtafoveal.